The AMSAT® Journal

Editor
Dan James, NN0DJ
Editorial Staff
John Bubbers, W1GYD

Volume 25, No. 4 July/August 2002

CONTENTS

KiwiSAT: A New Zealand Amateur Radio Satellite 1
By Various Members of AMSAT-ZL

Apogee View.....3
by Robin Haighton, VE3FRG

AMSAT-India VUSAT Project.....8
by Nagesh Upadhyaya, VU2NUD

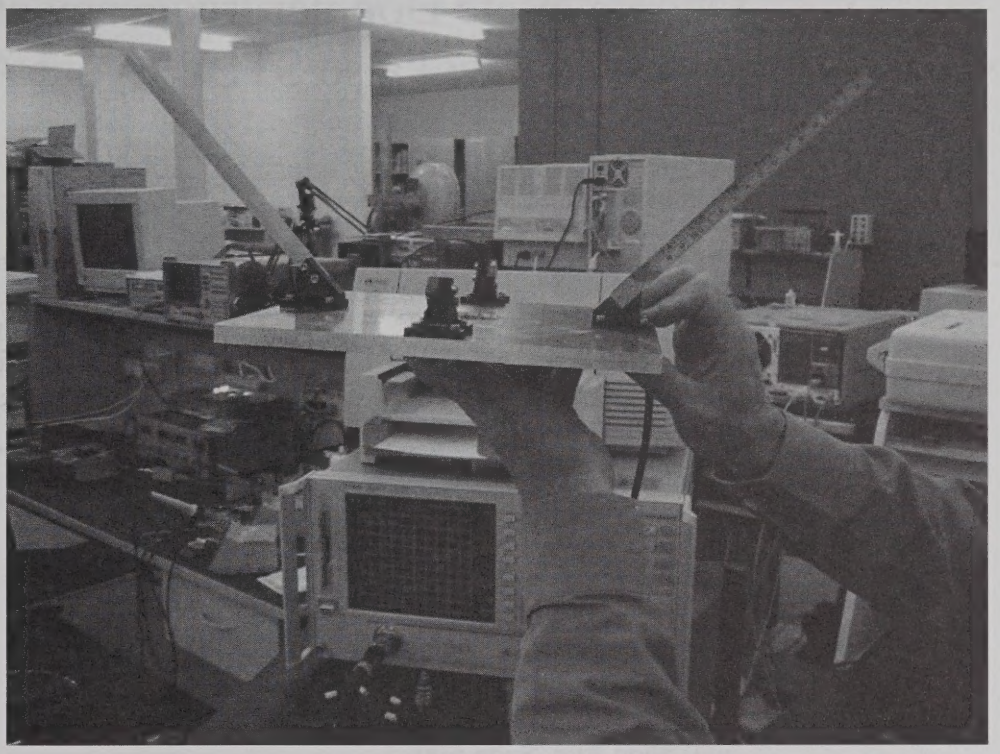
Our AMSAT-NA Donors.....10

AMSAT Annual Meeting and Space Symposium Announcement.....17

Field Ops Update: Dayton Hamvention.....18
By Barry Baine, WD4ASW

AMSAT Journal Telemetry.....22

OSCAR-7 Lives!.....26
By Andy MacAllister, W5ACM



A prototype of AMSAT-ZL's KiwiSAT antenna system and mounting mechanisms are displayed in the laboratory environment. The following article describes efforts-to-date to design and construct KiwiSAT.

KiwiSAT
A New Zealand Amateur Satellite Project
By Various Members of AMSAT-ZL

A little over two years ago AMSAT-ZL initiated a feasibility study to investigate a small wholly New Zealand designed and constructed satellite. The satellite, named KiwiSAT, is proposed for launch into Low Earth Orbit [LEO] and would become one of the OSCAR series that are available for international use by Amateur Radio enthusiasts worldwide. To date, more than 40

[continued on page 4]

AMSAT-NA
850 Sligo Avenue, Suite 600
Silver Spring, MD 20910-4730

07253 N8GNJ 2003.05
[redacted]
REDMOND WA 98073-0084

Periodicals

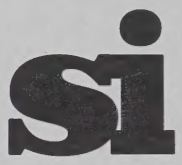
POSTAGE PAID

At Silver Spring, MD and at additional mailing offices

Do you still use manual tuning to remove Doppler changes? Why not automate?

Uni-Trac 2000 will automatically tune your Receiver (and Transmitter) to compensate Doppler frequency changes. Uni-Trac will also STEER your Antenna !

Uni-Trac 2000, including Interface Cable $260.00
FOB Concord, Mass. 01742, USA.



Spectrum International, Inc.,
P.O. Box 1084,
Concord, Mass. 01742, USA.
Tel: (978) 263-2145
Fax: (978) 263-7008

AMSAT® President's Club

Send to: AMSAT Corporate Secretary
850 Sligo Ave. Suite 600
Silver Spring, MD 20910-4703

Please sign me up for the AMSAT President's Club. You may charge my credit card account once every month for one year as indicated ☐ *or* I am enclosing a check ☐.

Name: _____ Call sign: _____

Address: _____ City: _____

State/Province: _____ Zip/Postal Code: _____

President's Club Gold: ☐ US $100 per month *or*
☐ US $_____ per month (at least US $100) *or*
☐ US $ _____one-time check or charge (at least US $1200)

President's Club Silver: ☐ US $50 per month *or*
☐ US $ _____ per month (at least US $50) *or*
☐ US $ _____one-time check or charge (at least US $600)

☐ VISA or ☐ MasterCard Number: _____ Expiration:_____

Signature: _____

Radio Amateur Satellite Corporation (AMSAT-NA)
850 Sligo Ave., Silver Spring, MD 20910-4703
Telephone: 301-589-6062 - Facsimile: 301-608-3410
AMSAT-NA Club Callsign - *W3ZM*
AMSAT-NA WWW: *http://www.amsat.org*

***The AMSAT Journal* Staff**
Editor-in-Chief: Dan James, NN0DJ
Circulation: Martha Saragovitz
(*martha@amsat.org*)
John Bubbers, W1GYD

AMSAT-NA Board of Directors
Bill Tynan, W3XO (Chairman); Keith Baker, KB1SF; Tom Clark, W3IWI; Dick Daniels, W4PUJ; Robin Haighton, VE3FRH; Bruce Paige, KK5DO; Barry Baines, WD4ASW

AMSAT-NA Officers
President:
Robin Haighton, VE3FRH
Executive Vice President:
Keith Baker, KB1SF
Vice President, Operations:
Keith Pugh, W5IU
Vice President, Engineering:
Stan Wood, WA4NFY
Manager, Orlando Laboratory:
Lou McFadin, W5DID
Vice President, Human Space Flight:
Frank Bauer, KA3HDO
Vice President, Field Operations:
Barry Baines, WD4ASW
Vice President, User Services:
Bruce Paige, KK5DO
Vice President, Electronic Publication:
Paul Williamson, KB5MU
Vice President, Development:
Walter Wittenberg, K0CEH
Vice President, Strategic Planning:
Bill Burden, WB1BRE
Vice President, Public Affairs:
Dan James, NN0DJ
Vice President, Education Liaison:
Steve Bible, N7HPR
Founding President Emeritus & VP, Government Liaison:
Perry Klein, W3PK
Treasurer:
Art Feller, W4ART
Corporate Secretary:
Martha Saragovitz
President Emeritus:
Tom Clark, W3IWI
Immediate Past President:
Keith Baker, KB1SF

Editorial Office: Dan James, NN0DJ, P.O. Box 297, Warroad, MN 56763, Internet: *nn0dj@amsat.org*; telephone: 218-386-4149.

Advertising Office: AMSAT-NA Headquarters, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703.

The AMSAT Journal (ISSN: 1407-3076) is published bi-monthly (Jan, Mar, May, Jul, Sep, Nov) by AMSAT-NA, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703. Telephone: 301-589-6062, fax: 301-608-3410. Periodicals postage paid at Silver Spring, MD, and additional mailing offices. Postmaster, send address changes to *The AMSAT Journal*, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703.

Opinions expressed by *The AMSAT Journal* are those of the article and author and not necessary those of AMSAT-NA. Copyright© 2002 by AMSAT-NA, The Radio Amateur Satellite Corporation. AMSAT is a registered trademark. Reproduction material from *The AMSAT Journal*, mechanical, electronic, or photocopy, is prohibited unless written permission is obtained from the author.

The AMSAT Journal staff is always interested in article submissions. Whenever possible, text should be on IBM compatible diskettes with hardcopy or original photographs or figures. AMSAT-NA reserves the right to select material for *The AMSAT Journal* based on suitability of content and space considerations. The editors of this publications are volunteers giving freely of their talents, time, and efforts to produce *The AMSAT Journal*.

Apogee View

Today, in Mid-July, I have been reviewing some of the possible configurations for *Eagle*, and I have to admit that they look excellent. Although we have not made final decisions on all of the electronics for *Eagle*, a number of parameters have become apparent, based on our experience with AO-40 and other satellites.

Firstly, by definition, *Eagle* is a Phase 3 satellite. In other words it is intended to be launched into an elliptical orbit, known as a Geosynchronous Transfer Orbit (GTO). Eagle will have transmission and receiver qualities that our membership has asked for i.e., Mode B (or as I prefer to think of it as Mode U/V). In addition we anticipate having mode L/S and mode U/S available.

Another of the attributes of *Eagle* will be, that it will not be subject to going into low power modes or switched off, due to changing sun angles. Current designs are that it will maintain full power with any anticipated sun angle. However *Eagle* is being designed so that in event of an orbital problem, we should still be able to get full power from the solar cells.

In late September of this year we will be having a design meeting of the senior designers for *Eagle* and those of you who attend the Annual meeting in Fort Worth will be able to hear about the latest design advances for our new bird as proposed by the design crew. Your input, at the Space Symposium, will be welcomed and fed to the design team.

Meanwhile *OSCAR-Echo*, due for launch in about eighteen months, is progressing well. In the last issue of *The AMSAT Journal*, Rick Hambly, W2GPS' article answered many questions, except for those from non-members who were unable to read it! (Recently, the article was reprinted in *CQ VHF* magazine.)

I hope that as we progress with both *Eagle* and *Echo* additional articles will appear in *The AMSAT Journal* with up to the minute information appearing in the AMSAT News Service (ANS). We have over 3000 subscribers to the weekly ANS that is a free compilation of AMSAT related news. Should you wish to become a subscriber, send a message to *majordomo@amsat.org* then in one line put *subscribe and your callsign.*

One of the important things that we have to do in supporting AMSAT is to continually look for new potential officers. Each new officer receives training before being asked to fill the chosen office. The more senior the office the more training the officer receives. I am looking for several *assistant officers* to share the load with the existing officers and to eventually become Vice-presidents of AMSAT or even the President! - If you are interested in any office please contact me at *ve3frh@amsat.org* sending me a brief resume of your capabilities, or by filling out one of our volunteer forms, which can be requested on our web page (www.amsat.org) by clicking on Volunteer survey (about halfway down on the right hand side). For a list of the officers, look at page 3 of this issue.

As a closing remark, I would like to welcome the new Editor of *The AMSAT Journal*, Dan James, NN0DJ. Dan has spent several years as editor of ANS and when this position became available, it seemed that Dan was the natural person to take over. I am sure that we will all welcome Dan to his new position in AMSAT.

Robin Haighton, VE3FRH

President ■

Remember to Make Plans to Attend the 20th Annual AMSAT Annual Meeting and Space Symposium
08-11 November 2002
Fort Worth, Texas
To register see page 17

See Y'all in Fort Worth - Where the West Begins!

[Continued from page 1] OSCARs have been successfully launched in an evolving program of increasing sophistication.

Spearheaded by Committee Member Fred Kennedy, ZL1BYP, the study concluded that such a project was possible and his requests for support and assistance identified expertise available and willing to undertake the work. A way ahead was determined.

To enable the AMSAT-ZL membership to make realistic mission proposals, it was decided that *size* would be the controlling factor. Initially, the small CubeSAT format was investigated but soon abandoned and it was proposed in July 2001 that a 237mm-sided cube satellite, based on the early 1990s Microsat format would be adopted for *KiwiSAT*.

The Committee supported this proposal. Now action and support from the Membership and other worldwide AMSAT members is needed to bring the project to fruition.

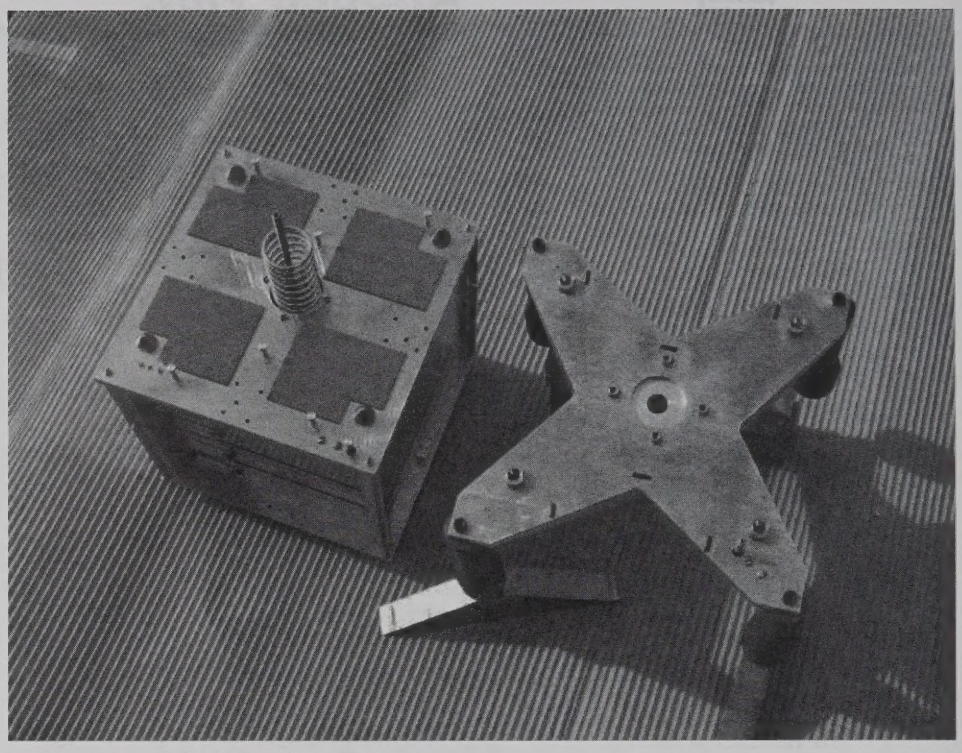
During ZL1BYP's many presentations and demonstrations using a 100mm /1kg *CubeSat* engineering mockup, a number of volunteers came forward to help and now is the time for them to *firm up* on the offers made and start some positive action. More actions are, of course, needed.

First and foremost is the decision on a mission. Although some proposals are already under consideration, as wide a view as possible is vital to ensure the satellite satisfies most, if not all, of those who may be asked to contribute financially and in particular those providing technical expertise and effort. Apart from the obvious satellite communications role there is also room on *KiwiSAT* for a small scientific package to increase our general knowledge of physics and/or space operations and technology.

Your views and ideas of what to include are needed now as this particular decision is imminent. Most importantly, the scientfic package to be carried must be defined.

A Call for AMSAT Assistance

Whatever form KiwiSAT takes it requires people that can design and build – or adapt existing equipment - in the fields of VHF, UHF (and Microwave?) transmitters and receivers, computer (PC's?) hardware and software, antenna systems, power supply systems using solar cells and batteries. We are learning that Attitude Determination and Control (ADAC) is a subject all on its own and, depending on the mission to be flown, one which will require special attention and effort.



A prototype of the mounting platform and spring-release mechanism for KiwiSAT.

A fundamental requirement is the mechanical construction of the space frame along with its structural testing. Whilst this is in the care of Fred, ZL1BYP, who has already invested heavily in time and effort on these over the past two years he cannot go it alone. Additional help is needed.

There will be a need for project management expertise and, hand in hand with that, quality control systems that will be vital to satisfy the stringent quality demands of a launch authority once that stage is reached.

Properly organized and pursued sponsorship from industry is important. As one example, Massey University in Auckland has already provided a seed grant and are making available vital facilities. Their funded and specially prepared *Vacuum Environmental Test Rig* provides, in small scale, space simulation capabilities of equal capability to those used in the pre flight proof testing of Phase 3D (now AO-40).

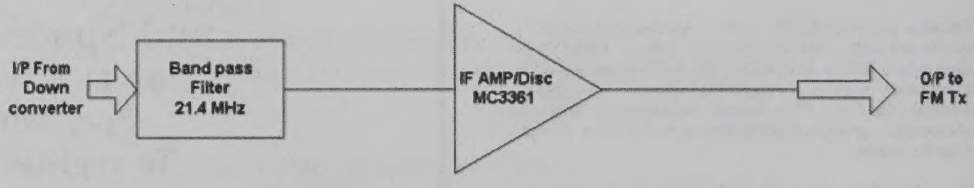
A number of other scientific centers of excellence within New Zealand have also offered test and calibration facilities and there is no doubt that more would follow suit if properly approached. The list goes on.....!

Without determination and personal effort from a dedicated group of people prepared to stay the distance, New Zealand may never be actively involved in space technology.

Communication Links for KiwiSAT

Power: Since the power available from the solar cells will be a maximum of 15 Watts and an average of 6 watts, the transponders must be designed for a minimum current drain for maximum RF power out.

The design goal is to obtain 1 Watt RF out-



FM RX IF section

put power for 4 Watts DC input.

Frequency Choices: Since we are limited to 1 Watt EIRP by the available power, we must limit ourselves to 10 Metres, 2 Metres, or 70 CMs for the downlink.

Decision: The AMSAT-ZL committee therefore have decided for KiwiSAT to have 2m down links and uplinks on 70cm and 23cm.

A 2m down link has a number of advantages:

- 9dB greater field strength than 70 cm.
- It can use antennas that do not need to be deployed.
- Almost all current satellite users are equipped for this mode.
- Access to a wider *non-satellite community* if FM can be used.
- More efficient conversion of DC to RF.
- A 70 cm uplink less susceptible to interference from unlicensed transmissions than 2M.

The 70 cm uplink/2M downlink is known as Mode U/V or Mode B and has been used in many satellites over the years.

Linear Versus FM Transponders

Linear Advantages:

- Linear mode allows more than one station to use the transponder at a time.
- Little power is used when the transponder is not in use.
- Doppler shift is handled at the ground station.
- Current satellite users are already equipped for this mode from AO-10 and AO-13.

Linear Disadvantages:

- More complex ground stations than with FM.
- Strong uplink signals will activate the automatic gain control and prevent weaker stations from accessing the bird.

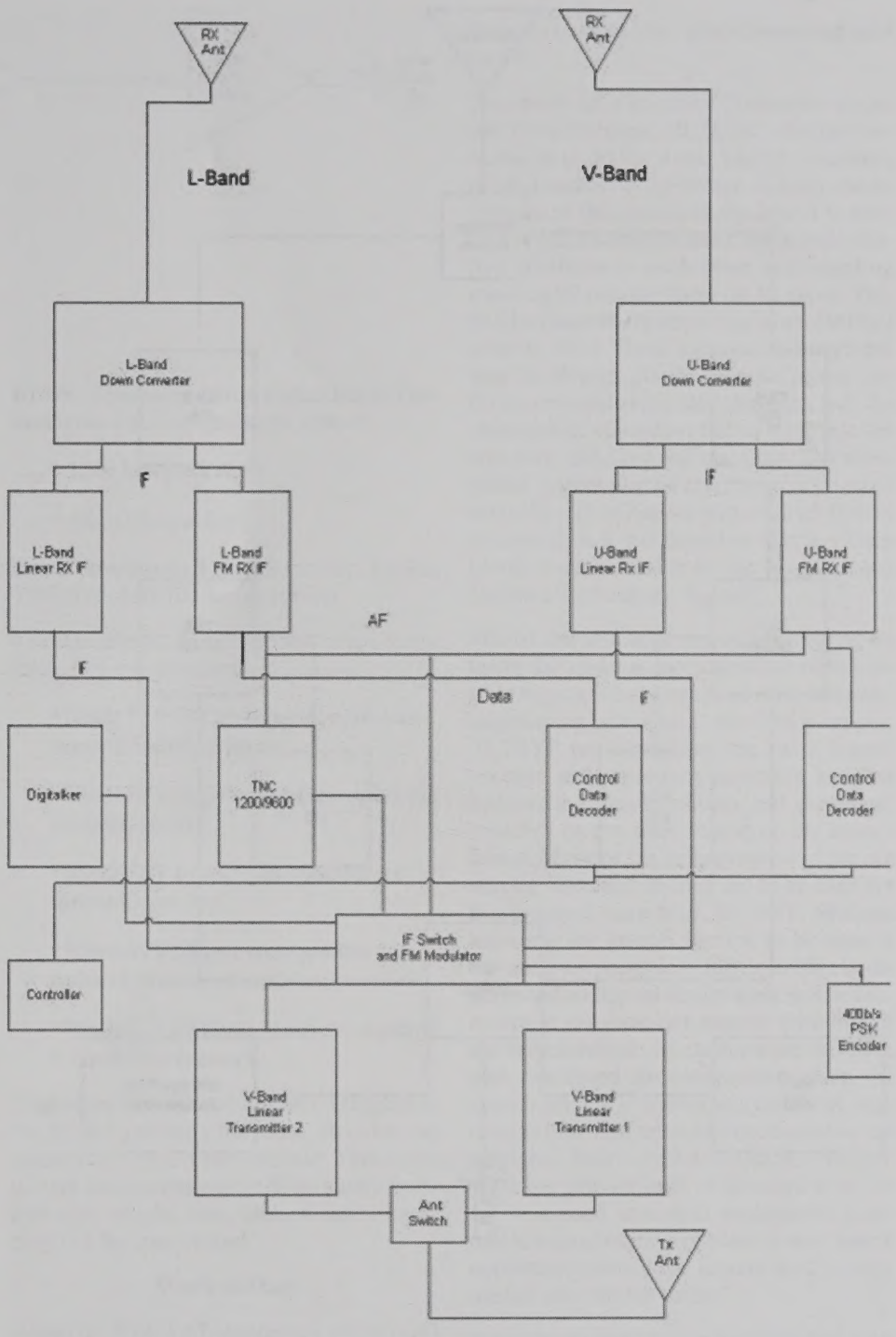
FM Advantages:

- Dual-band handhelds can be used with portable Yagi antennas.
- New users can be recruited using their existing equipment.
- Transponder easier to construct with readily available chip sets.
- Transponder power is concentrated on one user.

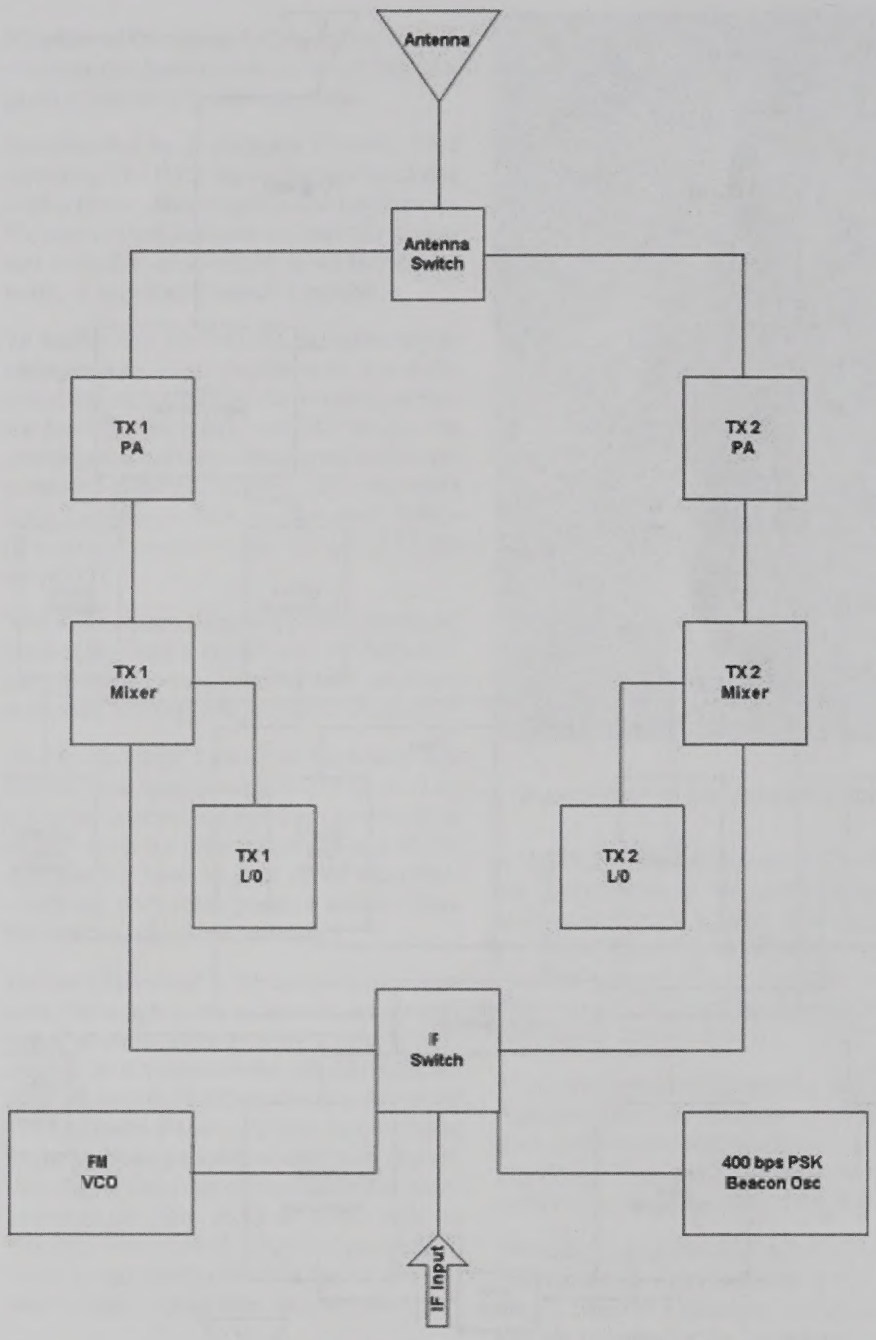
FM Disadvantages:

- Only 1 station can use the bird at any time.
- The strongest uplink signal will capture the bird.
- Full transmitter power is used at all times (unless turned off).
- Higher average power consumption than a linear transponder.

Decision: Bearing all this in mind the AMSAT-ZL committee have decided that KiwiSAT should have both linear and FM transponders.



A Diagram of KiwiSAT's L- and V-Band System



A diagram of KiwiSAT's transmission system.

Link Budget Calculations

Path Loss Formula L(dB) =32.45 +20 log F(MHz) +20 log D(Km)

Given: Maximum distance for 800 km polar orbit = 3000 km and minimum distance for orbit = 800 km

Downlink:

- Maximum path loss at 29 MHz = 131.24 dB
- Maximum path loss at 146 MHz = 145.28 dB
- Maximum path loss at 435 MHz = 154.73 dB
- Maximum path loss at 2400 MHz = 169.59 dB

Assume spacecraft antenna gain of 0 dBi, 1 watt transmitter power, and the following net antenna gains for the ground station:

- 29 MHz = 0 dBi
- 146 MHz = 6 dBi
- 435 MHz = 9 dBi
- 2400 MHz = 15 dBi

We obtain the received signals at maximum range as follows:

- 29 MHz = -101.24 dBm
- 146 MHz = -109.28 dBm
- 435 MHz = -115.73 dBm
- 2400 MHz = -124.59 dBm

So 29 MHz, 146 MHz, or 435 MHz provides a workable downlink signal.

Doppler Shift: (Taken from *The Satellite Experimenters Handbook* table 13-1 page 13-5)

- 29 MHz = 0.70 KHz
- 146 MHz = 3.45 KHz
- 435 MHz = 10.3 KHz
- 2400 MHz = 56.7 KHz

So 29 MHz, 146 MHz, or 435 MHz again provides a workable downlink signal.

Uplink:

- Maximum path loss at 146 MHz = 145.280 dB
- Maximum path loss at 435 MHz = 154.73 dB
- Maximum path loss at 1270 MHz = 164.06 dB

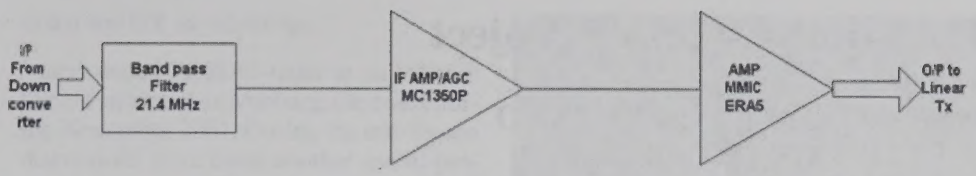
Assume spacecraft antenna gain of 0 dBi, 10 watts transmitter power, and the following net antenna gains for the ground station:

- 146 MHz = 6 dBi
- 435 MHz = 9 dBi
- 1270 MHz = 15 dBi

We obtain at the satellite at maximum range received signals as follows:

- 146 MHz = -99.28 dBm
- 435 MHz = -105.73 dBm
- 1270 MHz = -109.06 dBm

So 146 MHz, 435 MHz or 1270 MHz provides a workable uplink signal.



Linear RX IF section

Doppler Shift:

- 146 MHz = 3.45 KHz
- 435 MHz = 10.3 KHz
- 1270 MHz = 30.1 KHz

So 146 MHz or 435 MHz will provide a workable uplink signal. 1270 MHz will work but will require special Doppler compensation.

KiwiSAT Communications Modules

Telemetry System: We can't do anything with KiwiSAT unless we know how well the spacecraft systems are performing. This is so essential that we need two systems to ensure that we always have telemetry.

KiwiSAT is to have two separate telemetry systems.

- **400 bps PSK**
- **1200 bps AFSK packet**

There are a number of alternatives e.g. CW, PSK31,

Parts required: Transmitter with PSK modulator, FM transmitter and Packet TNC.

Forward Control System: We need to be able to turn on and off the various systems on the spacecraft to ensure that the batteries remain healthy i.e. balance the power budget.

KiwiSAT is to have two separate Forward Control Systems.

- DTMF decoder from an FM receiver
- 1200 bps AFSK packet from an FM receiver

Parts required: FM receiver(s), DTMF decoder, and Packet TNC.

Science Data: To make the science package data available to everyone we need a simple data transfer system.

KiwiSAT plans for data in Packet Radio Format from a science package, either:

- **1200 bps packet, or**
- **9600 bps packet**

Parts Required: FM transmitter, Packet TNC, PACSAT file server system

Transponders: KiwiSAT will support the following transponders:

- **Mode U/V FM transponder (all components included above)**
- **Mode U/V digipeater (all components included above)**
- **Mode U/V Linear transponder (requires linear IF)**
- **Mode L/V Linear transponder (requires L band receiver)**
- **Mode L/V FM transponder (requires L band FM receiver)**

Digitalker: KiwiSat could carry a Digitalker for ID and publicity purposes. Requires an additional digital voice module. This is the current list in priority order. If we have a problem with weight, size, time etc some items may not be constructed.

Work-to-Date

Work on KiwiSAT continues on several fronts. With much of the basic mockup structure completed attention has been turned to the electronics design and some key decisions were essential. These have now been made. It is planned to uplink to the satellite on two bands - 70cm (U) and 23cm (L). The downlink will be on the 2m Band (V). With the bands now decided, progress is underway on the antenna system and a set of parts have been produced for the U and V Band antenna supports together with the necessary feeder network connections boxes. The antennas will use traditional *measuring tape* material and a second mockup, this time in *skeleton* form, has been built to allow the antennas to be cut, interconnected and tuned.

The mock-up is in use by Committee member Terry Osborne, ZL2BAC who has undertaken to do the work. Use of a *skeleton* offers a number of advantages. Firstly, modification of the parts and the layout is easy whilst still placing the antennas in their relative positions to each other and enabling meaningful measurements to be taken. This will be particularly important when the third system, the L Band antenna, is integrated into the design. As the various layout options are evaluated the skeleton will be shrouded in aluminum foil to represent the structure and *complete the cube*. The completed system will be computer modeled to establish its radiation pattern and finally evaluated in a test chamber that has been kindly made available by the New Zealand Defence Technology Agency.

Whilst the antennas are being worked on using the *skeleton* mockup it has been possible to progress the structure using the main engineering unit. Using, this Fred Kennedy, ZL1BYP has completed the basic launch support and separation structure and has installed the release indicator and 'power up' switches on the satellite and on the launch frame. Many of the parts progressed are not strictly 'mockup' as they are to be used for the eventual launch of *KiwiSAT*. Without knowing the launch agency to be used it has not been possible to fully machine some items and additional design work will be necessary to integrate our support with that of the launch vehicle. Some items are therefore part machined for completion when the launch agency is known and details of their integration and release mechanisms are available. This is well down track at the moment but with the bulk of the work done we are in a good structural engineering position to take advantage of a last minute launch opportunity should one present itself. A very useful 'shot for the locker'!

It may seem that all is in hand but that is far from the case.

The Committee is encouraged by the positive response from industry throughout New Zealand with enthusiastic support and free offers from areas as diverse as basic material through sophisticated electronics. Coordination of these offers will be a task in itself but very rewarding for the project.

In closing, we look forward to AMSAT members worldwide assisting us in preparing *KiwiSAT* for launch. You may contact us via the AMSAT-ZL WWW site: *http://www.amsat-zl.org.nz/* ■

AMSAT-India VUSAT Project

Nagesh Upadhyaya, VU2NUD
AMSAT-India
607, ISRO Layout, Bangalore, 560 078, India
ham@vsnl.com

It has been a long-cherished dream of Indian hams to have their own satellite for radio amateur communication purposes. In realizing this dream, a final thrust was given during last year (2001) that resulted in a fruitful development of Indian Space Research Organization recognizing the efforts of AMSAT-India by asking it to go ahead to make a satellite payload for the purpose.

Actually those seeds were sown about two years ago, in the December 2000 during HamRadio2000 meeting in Hyderabad, when R. Ramesh, VU2RMS; S. Rama Mohan Rao, VU2RM; and myself shared the podium to discuss the construction of the first Indian Amateur Radio satellite. There we made a conscious decision to make an Amateur Radio satellite prototype for demonstration. At that time, we said *now or never* and in fact vowed that if nothing happens in next two years we'll not talk about an Indian amateur satellite in future. And the gods were listening! They made us talk about it again and again!

Back home, during January 2001, I sent an e-mail communication to each and everyone who may be even remotely interested in such an idea. The interactions gained further momentum with Sanath, VU2YI forming VUSAT, an un-moderated discussion group on egroups.com (it is now changed to *www.yahoogroups.com*). Bindu Rao's, VU2IR bulletins gave good publicity for this nascent project. In addition, I also started the *sat-chat net* on 7.070 MHz and we started discussing the amateur satellite on another HF net.

By this time, international recognition also started coming in with AMSAT-NA, AMSAT-UK, AMSAT-DL and others supporting the cause strongly. (*Editor's Note: See November/December 2001, March/April 2002 and May/June 2002 issues of The AMSAT Journal.*) AMSAT-Italy went a step further with its President, Paolo Pitacco, IW3QBN offering a free transponder for a ride and co-existence on our satellite. In the first meeting held in January 2001, we named the project as VUSAT. Among the other issues finalized were the mode of operation, forming functional groups, taking up the task of developing an Indian (VU2) transponder and beacons. In that well-attended meeting, under the guidance of senior hams like V. Suby Subramanian, VU2UV, Bindu Rao, VU2IR, Bob Kohli, VU2MKP and others, it was decided to go for the Mode–B (UHF uplink and VHF downlink) transponders and beacons on VHF.

Hams from the other parts of India pitched in to contribute to this national project. Sri Bhat, VU2SBJ from Manipal and T. K. Mani, VU2ITI took up the job of developing a voice beacon and a telemetry beacon for the satellite. A technical committee was formed with view on hardware development. A group of 4-5 hams from Bangalore from among the technical committee took up the job of making the Indian transponder. The team included Dev Prabhu, VU2DEV, B.S. Kumar, VU2BGS, Pop Kumar, VU2POP, Mani Subramani, VU2WMY.

The idea of developing a *ham payload* instead of the full satellite got acceptance as this was our first effort and we did not have the resources in terms of manpower, time and money. A *payload* as an instrument is the easier thing to do. This would interface with the satellite elements like power, telemetry and telecommand systems. The job of developing the satellite structures, solar cells, batteries and other sub-systems as well as commanding is left to the experts from the satellite organization. Maybe in the next attempt we will make a complete satellite!

The thrust to have the satellite was kept up with activities such as a visit by an AMSAT group to the ISRO satellite center where we met with the director. We also visited the ISRO tracking center and visited the Sri Hari Kota (SHAR) Launch range, etc. The final cap came when I led our team to meet the Chairman of ISRO. He, along with their Scientific Secretary gave us a patient hearing and excellent encouragement to pave way for the realization of our satellite. Immediately after this, we launched our own websites *www.amsat-india.org* / *www.amsatindia.org*. Meanwhile we officially formed AMSAT-India as a national organization in October 2001 with the support of international, national, local organizations and clubs and also individual hams. Concurrent with the array of other international AMSAT organizations, AMSAT-India has the primary goals of constructing and launching Indian OSCARs. Memberships were opened with individual, life, institu-

Members of AMSAT-India pose for a group photograph during a tour of the India Space Research Organization Satellite Center.

tional and DX memberships.

I represented AMSAT-India at an international conference in Marburg, Germany during November 2001. During the one-to-one discussions there came another useful proposal from the Dutch expert William Leijjannar, PE1RAH who wanted to complement our efforts with his own transponder for a ride on VUSAT. The final recognition to the group came with our national space agency giving a go-ahead to AMSAT-India for a payload for a satellite named Hamsat. Immediately after this, we were asked to submit a formal technical proposal. In the comprehensive proposal submitted last June, we have identified the following elements:

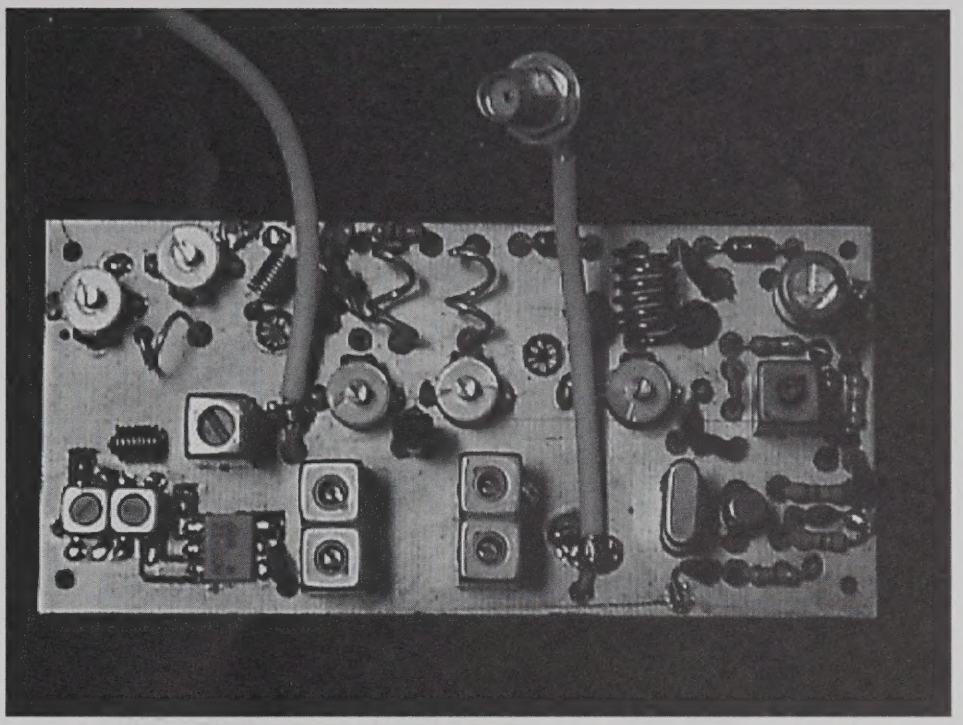
Message/Voice Beacon: This is basically to help the novices to get a feeling of the satellite. It will also help them track VUSAT. Beaming pre-recorded voice messages on the 145 MHz band in FM mode, this will be the easiest mode for any ham to receive the signals from our satellite. This would give anyone with a simple HT the thrill of monitoring the satellite.

Telemetry Beacon: This is a beacon giving Morse-coded parameters of the satellite / payload on 145 MHz. One would be able to receive signals on FM receivers and know the present value of parameters like voltages, currents, and temperatures.

Transponders (Indian/Italian/Dutch): Will operate in Mode-B meaning one can transmit to the satellite on 435 MHz and receive signals from the satellite on 145 MHz. That is, to make a QSO through the satellite you will need to send signals on UHF and get signals on VHF. They will have their own Morse ID generators for tracking during passes. While they are linear transponders, CW/SSB modes are encouraged to avoid any power crisis on the satellite. As you know power is a precious resource on the satellite. Onboard power has also put lot of constraints in design and development of VUSAT elements. These transponders and beacons are scheduled for operation one at a time.

So, with two FM beacons and three linear transponders we hope to cater to a majority of hams in the country who are interested in satellite activity and reliability. One would need the usual FM *handies* to monitor the beacons on VUSAT. But to make a QSO through the satellite it is suggested that one use a UHF/VHF dual-band transceiver with good beam antennas,

VUSAT will be a small 40kg satellite that classifies it in the micro-satellite class. It will likely to be flown onboard India's Polar Satellite Launch Vehicle (PSLV) as an auxiliary payload, flying with a larger satellite of IRS (Indian Remote Sensing) class. VUSAT will fly in an 800Km circular orbit which would give us 3-4 passes each day of about 10-15 minutes duration. The microsatellite will have a cubical structure of roughly 600mm^3 volume and the spin-stabilized structure will have body-mounted solar panels on all four sides and possibly on top. Communication with the satellite will be through shared UHF/VHF turnstile antennas mounted on the top deck,



AMSAT-Italy's VUSAT DCB transponder module.

The satellite is scheduled for launch in the year 2003. Let us hope that the next yearwill be the golden year for the Indian Ham-satellite enthusiasts.

Gear up your station for VUSAT! R U ready?■

AMSAT-India members with ISRO Chairman and Chief Scientist Dr. K. Kasturirangan (center).

Our AMSAT-NA Donors

All radio amateurs who enjoy using our satellites owe a debt of gratitude to those who contribute both talent and dollars beyond paying annual dues. Those who donate time and talent are honored at our annual symposiums award dinner. The many who have also generously given financial support have not been regularly recognized heretofore. The attached list of 1060 donors from the US, Canada and 27 other countries is presented in the following pages to express all of our thanks. The list includes donors between late 1999 when our current record keeping system was started and 31 May 2002. Many of the donations were for specific projects such as Phase 3D and those individuals should be assured that their money was used for the designated purpose although not reflected in the list.

The combined contribution of these individuals totals over $160,000. Every attempt has been made to insure the list's accuracy and that all were included or their wishes for anonymous listing were honored. If we have erred, please accept our apology and notify Martha at AMSAT-NA headquarters.

The listing is in order by call sign FCC region and alphabetically for the U.S and Canada. Other countries and other donors are listed separately. **Bold** typeface indicates a combined donation of $100 or more. President's club members are indicated by **PG, PS or PB** (Gold, Silver or Bronze).

Again, on behalf of all of our members we express our thanks for your continual support. We cannot succeed without you!

- 1 -

K1BXE		Y.P. PHILLIPS
K1CJJ		**ROBERT HURLE**
K1DS		RICHARD ROSEN
K1ELA		ERNEST MACLAUCHLAN
K1FC		FRED CUNNINGHAM
K1KWP		KEVIN PAETZOLD
K1LKR		**RICHARD STEEGSTRA**
K1MR		**DAVID ROSENZWEIG**
K1MYL		LEONARD MONIZ
K1PDY		RONALD T. HERMAN
K1WW		**RAY CRITES**
K1YPZ		RAY WEBB
KA1DF		**GEORGE B. PEARSE**
KA1EPF		GEOFFREY GIDMAN
KA1IU		MORTON D. COHAN
KA1JMF		**JOHN MORLEY**
KA1LM		STEPHAN GREENE
KA1MJ		GEORGE F. MANCINI
KB1CIC		BRUCE MCARDLE
KB1EB		JOHN ANTES
EX-KB1PI		BLANCHE DAVIS
KB1SF		**KEITH BAKER**
KD1DT		STEVE HOSE
KD1SM		RALPH SWICK
KN1O		ALAN AMOS JR
KR1ZAN		**FRANK KRIZAN**
KV1D		MAURICE MARKS
KV1F		UVE LAMMERS
N1ATB		**JOHN D. WEINLAND**
N1AWR		**MATTHEW CALDWELL**
N1BQ		BRIAN RILEY
N1CRK		MAURICE POLAYES
N1FLD		ALAN ROSE
N1FZX		NAT STEIN
N1IUP		**HAROLD A. READ III**
N1JEZ		**MICHAEL SEGUIN**
N1MEO		FLETCHER W. SEAGROVES JR
N1OWU		**DOUGLAS BRAUN**
N1QOV		JAN O'BRYAN
N1SB		STEPHEN BARANOWSKI
N1SBB		THOMAS DAVIS
N1VQR		**ROBERT MARTINSON**
W1AD		FRANCIS D'AURIA
W1BIH		JOHN THOMPSON
W1DJX		GEORGE ZAK
W1EVU		LARRY E. TELFORD
W1GBO		**DON DORSON**
W1GYD		JOHN J. BUBBERS
W1JR		**JOE REISERT**
W1JSM		DONALD F. BROWN
W1LID		WILLIAM A. MELANSON
W1MU		**MIKE ZAK**
W1NHS		**FRED W. RING**
W1NSD		JOHN COPLEY
W1NU		VIC POLITI
W1NWE		THOMAS LEIPER
W1NXP		NATHAN TALBOT
W1OTH		**RAY FOBES**
W1PUV		ALEXANDER KULCHUK
W1VB		**VERN BROWNELL**
W1SI		**HUNTER HARRIS**
WA1BAR		ERROLL DRINKWATER
W1CHE		**FRANK MROZ**
WA1DMV		**BILL POLEWARCZYK**
WA1ECF		**J.S. LAINE**
WA1IXU		JIM AHRENS
WA1QXR	**PS**	**KENNETH CHAFFEE**
WA1ZVA		JOSEPH CONNERY
WB1DXP		ERNEST CHAREST
WI1I		BERNARD QUARTAROLI
WW1Y		**JAMES HEEDLES**

- 2 -

AA2BN		**JOHN A. ZARUBA JR**
AA2TX	**PG**	**ANTHONY MONTEIRO**
AB2CM		HARRY K. SCHWILL JR
K2GDE		**JOSEPH KELLEY**
K2GLS		ROBERT WILLIS JR
K2IYQ		**STEVE TODD**
K2JNS		**JOHN ZAHRADNIK**
K2LHZ		JOHN SPITZER
K2NV		**ANTHONY BUSCAGLIA**
K2QCX		**THOMAS SLY**
K2UYH		DR. ALLEN KATZ
KA2RVO		JAMES AUSTIN
KB2AYU		**ALAN ARRISON**
KB2YOX		GARY STANDORF
KC2BDM		JOHN PETERSON
KC2CTJ		MEL KATZ
KC2DJX		DAVID JOHN LAWRENCE
KD2JF		JOHN GORDON
KE2IV		**GEORGE SCHNEPF**
KQ2V		SIMON JAWORSKI
KP2AV		BOB KALLAWAY
KW2U		**ROGER SODERMAN**
N2FAE		HARRY REGAN
N2GJ		**GERALD JURRENS**
N2GWS		JOSEPH AMATO
N2MB		**BARRY J. FORREST**
N2OML		ROBERT ROSS
N2PKW		**CHARLES HARDT**
N2QHS		RICHARD KOPS
N2QZF		WILLIAM MORRISSEY
N2REC		**JOHN EMRICH VOORHEES**
N2RPZ		MARK PHILLIPS
N2SCJ		ROBERT TURNER JR
N2SPI	**PG**	**RICHARD CROW**
N2WWD		KENNETH ERNANDES
N2YAC		ALLEN EMER
NA2X		ROBERT ROSSI
NP2L	**PG**	**MALCOLM PRESTON**
W2CID		GEORGE HOFFMAN
W2CIY		**WALTER CREUZ**
W2ELQ		HERBERT FOSTER
W2FS	**PB**	**JOHN HANSEN**
W2GFF		R.J. PEACOCK
W2HD		HARRY DANNALS
W2HWW		ANTHONY PLOSKI JR
W2HZN		JACOB HACK
W2IIC		JAMES HEPBURN
W2INE		HERBERT HUNSWORTH
W2KUC		JOHN T. HALL
W2LNX		**DAVID BERN**
W2RS		**RAPHAEL SOIFER**
W2TTM		EDWARD O'CONNOR
W2UCZ		GARY ANDERSON
W2UH		OTMAR SCHREIBER
W2VU		RICHARD S. MOSESON
W2XB		**DON BLACHURA**
W2XI		**ANTHONY CHIPALOSKI**
W2YTO		H.C. KNIEF
WA2EHL		RICHARD TYLER
WA2ELO		**WARREN S. HIRZEL**
WA2KDL		**CHRISTOPHER WACHS**
WA2KXE		ARTHUR ALTARAC
WA2NCT		RICHARD MATTNER
WA2NYM		JIM CORCORAN
WB2CIX		HERB SCHAEFER
WB2IFZ		JOHN M. ROSZKOWSKI
WB2KDO		**C.A. MAJOR**
WB2MKQ		WILLIAM VENEZIA
WB2QCJ	**PS**	**DEAN KEYSER**
WB2YTM		EDWARD HABECK JR
WB2ZZB		**HANS NAPFEL**
WH2ALC		MICHAEL BLAIR
WV2U		PAUL HELOSKIE

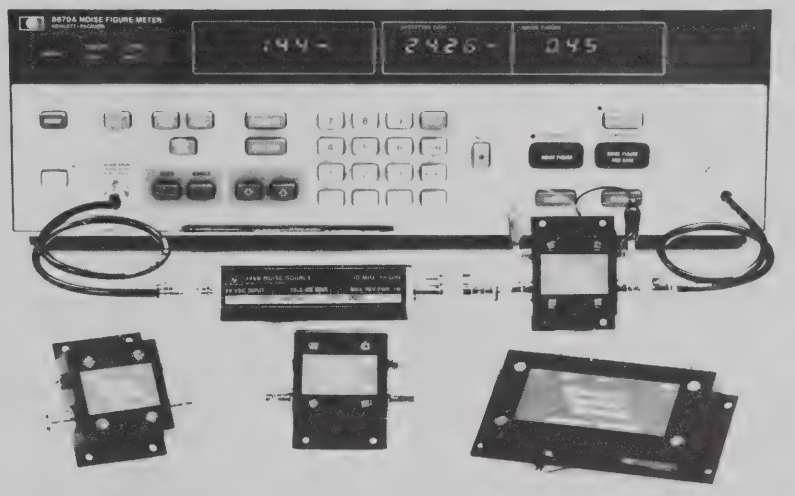
- 3 -

K3BY		SAM GUCCIONE
K3FMQ		**BILL BALLANTINE**
K3GNZ		SKIP GRACON
K3KN		**JOSEPH ROMANOSKY**
K3NCO		**MARC RESSLER**
K3NMF		CHARLES PENNINGTON
K3PER		**JOHN PINKHAM**
K3RQ		GEORGE MURPHY
K3TC		TOM CALOMIRIS
K3TNM		W.J. BENNETT
K3TOW		RICK RINEHIMER
K3VDB		CHARLES HEISLER
K3XS		**MARGARET STEPHANIE LEBER**
KA3HDO		**FRANK BAUER**

KA3HPQ	**WILLIAM M DAVIS**	**K4NTD**	**JACK ROSS**	**KB4TWN**	**BRADLEY MABE**
KA3QKV	T. LEWANDOWSKI	K4OGB	STANLY COUNTY ARC	KB4YML	ROBERT L. KEEFE
KA3YMK	RAY SOFIELD	K4PRK	JOHN BOEHME	KC4KK	BRIAN REHMER
KB3GI	ALEXANDER HANSKEN	K4RB	ROBERT BLUMBERG	KC4M	HARRY EARLY
KB3KJ	**JAMES C. MANKIN**	**K4RK**	**ROBERT KELSEY**	**KC4RI**	**MICHAEL STIPICK**
KC3DS	CHARLES WOOD	**K4SAT**	**JOSEPH LEIKHIM**	KD4ESC	DANA BYERLEY
KD3NC	**DAVE PAGE**	K4UAS	WALLY BERNATH	KD4FGH	FRED ROBINSON
KD3UY	ROBERT BAKER	**K4UJA**	**DAVID KENT**	**KD4HSL**	**LARRY SCHROEDER**
KE3D	**GORDON HARDMAN**	**KA4HPB**	**JOSEPH L. REDA**	KD4NEM	CHARLES ATTAWAY
N3AC	ALAN M. CHEDESTER	KB4ABE	MICHAEL BUSH	KD4O	PHILIP MOORE
N3AMF	JIM MCSHERRY	KB4ENQ	PAUL HARRINGTON	KD4ZGF	JOHN P. ABBEY
N3BXL	**RONALD PRINDLE**				
N3CZH	**CHARLES MASON**				
N3ES	EARL SKELTON				
N3GJX	**ED NOWICKI**				
N3HEV	CHRISTOPHER SOURIS				
N3IRY	ROY KRING				
N3NBT	**ROBERT GUNDLACH**				
N3NFK	**SAM AVAMPATO**				
N3OBY	FURMAN HENDRICKSON				
N3RAE	DAVID HOLT				
N3SAM	**BRANIN BOYD**				
N3TYD	AL WILLIAMS				
N3UNM	**EDWARD STEPP**				
N3VIN	KENTON FADELEY				
N3VLN	JIM HANLON				
N3WDS	CHARLES LIPTAK				
N3XM	**TOM MITCHELL**				
NM3A	**DANIEL WALTER**				
NX3B	**THOMAS J. RICCIO**				
W3ASK	**GEORGE JACOBS**				
W3BW	**BRIAN WRUBLE**				
W3DAD	KEVIN ARBER				
W3DZZ	**C.L. BUCHANAN**				
W3EZ	**W.R. JACKSON JR**				
W3FUO	**HUGH B. O'DONNELL**				
W3GMY	**GARY RYAN**				
W3GXT	LESTER L. MCCLURE				
W3HEF	DR IRA WEXLER				
W3HH	DOUGLAS HAWKINS				
W3IVH	**DOUGLAS JONES**				
W3IWI PG	**DR. TOM CLARK**				
W3MJP	MICHAEL PATTON				
W3MOE	GORDON MOE				
W3OTC	ROBERT J. CARPENTER				
W3QO	**ALLEN MOORE JR**				
W3SVJ	NATHAN S. FIRESTONE				
W3TFA	STAN BRIGHAM				
W3UJG	ERNEST WHITE				
W3XO	**WILLIAM A. TYNAN**				
WA3AEE	JOHN ZONDLO				
WA3BDV	THOMAS HUFNELL				
WA3EOQ	HOWARD REYNOLDS				
WA3FUJ	JAMES V. DEVILBISS				
WA3GFZ	PAUL SOKOLOFF				
WA3HVQ	GEORGE J. HERPICH				
WA3JWP	JOHN ZIEROWICZ				
WA3WOD	DONALD B. SYLVAIN				
WA3YMH	**LOUIS MAMAKOS**				
WB3S	ROBERT B. CECIL				
WD3N	FRANK GOSCHENHOFER				
WG3E	ALLEN S. HUBER				
WG3R	**CURTIS L. ROBINSON**				
WW3O	PETER CARR				

AA4RP	RONALD PACE
AC4AP	WADE W. FRAZEE
AD4DN	**W.W. MURRELL JR.**
AF4NR	DON THOMAS
AF4ZEB	JOHN C SWARTZ
K4ADK	G. MIKE MAPLES
K4ALB	ALAN BRIDGES
K4CLT	CHARLIE THOMSON
K4CSO	**CHARLES S. OSBORNE**
K4DSD	THOMAS N. PYKE JR
K4DXA	KENNETH W. BOYD
K4EMN	**ANTHONY ELIA**

High Performance **vhf/uhf preamps**



Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	<1.1	15	0	DGFET	$29.95
P50VD	50-54	<1.3	15	0	DGFET	$29.95
P50VDG	50-54	<0.5	24	+12	GaAsFET	$79.95
P144VD	144-148	<1.5	15	0	DGFET	$29.95
P144VDA	144-148	<1.0	15	0	DGFET	$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	$79.95
P220VD	220-225	<1.8	15	0	DGFET	$29.95
P220VDA	220-225	<1.2	15	0	DGFET	$37.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	$79.95
P432VD	420-450	<1.8	15	−20	Bipolar	$32.95
P432VDA	420-450	<1.1	17	−20	Bipolar	$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	$79.95
Inline (rf switched)						
SP28VD	28-30	<1.2	15	0	DGFET	$59.95
SP50VD	50-54	<1.4	15	0	DGFET	$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	$109.95
SP144VD	144-148	<1.6	15	0	DGFET	$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	$109.95
SP220VD	220-225	<1.9	15	0	DGFET	$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	<1.9	15	−20	Bipolar	$62.95
SP432VDA	420-450	<1.2	17	−20	Bipolar	$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	$109.95

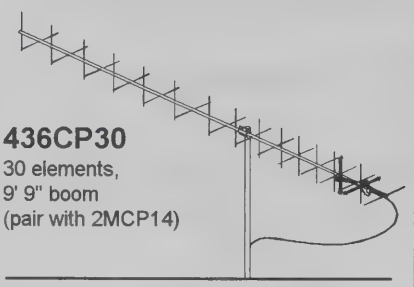
Every preamplifier is precision aligned on ARR's Hewlett Packard HP8970A/HP346A state-of-the-art noise figure meter. RX only preamplifiers are for receive applications only. Inline preamplifiers are rf switched (for use with transceivers) and handle 25 watts transmitter power. Mount inline preamplifiers between transceiver and power amplifier for high power applications. Other amateur, commercial, and special preamplifiers available in the 1-1000 MHz range. Please include $2 shipping in U.S. and Canada. Connecticut residents add 6% sales tax. C.O.D. orders add $2. Air mail to foreign countries add 10%. Order your ARR RX only or inline preamplifier today and start hearing like never before!

Advanced Receiver Research

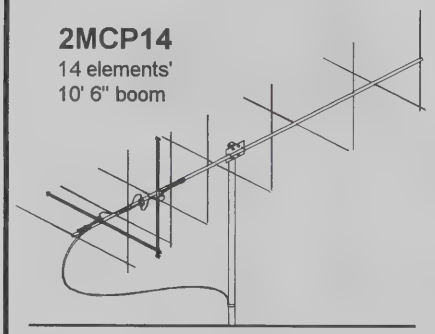
Box 1242 • Burlington, CT 06013 • 860 485-0310

M² YOUR SATELLITE ANTENNA SOURCE

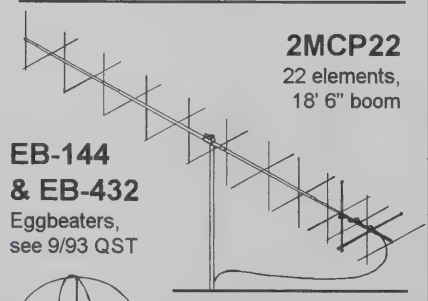
436CP42-U/G
42 elements,
18' 10" tapered boom
(pair with 2MCP22)



436CP30
30 elements,
9' 9" boom
(pair with 2MCP14)

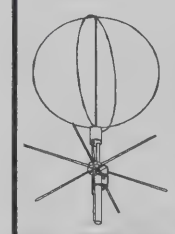


2MCP14
14 elements'
10' 6" boom



2MCP22
22 elements,
18' 6" boom

EB-144
& EB-432
Eggbeaters,
see 9/93 QST



- Stacking frames
- AZ & EL positioners
- Fiberglass crossbooms
- Power Dividers
- Phasing harnesses

M² 4402 N. Selland
Fresno, CA 93722
(559) 432-8873 FAX: 432-3059

DISC VISA

KE4AZN	MICHAEL KINGERY	**WB4QKQ**	**LAKEY TOLBERT**		
KE4PHA	JOHN SAYLE	WB4UIV	GLENN LITTLE		
KE4RFT	**THOMAS LEWIS**	**WB4ZMP**	**JOSEPH MORRIS**		
KE4TCS	**RANDALL JAMES HAGER**	**WD4ASW PG**	**BARRY BAINES**		
		WD4GYW	WALLACE HANSON		
KF4HVL	WILLIAM A. TOWNSEND	WP4KVH	RICARDO VELEZ-JIMENEZ		
KF4LM	LTC RICK REICHERT				
KF4OW	**P. KENNETH PIERPONT**	WY4D	BENNIE A. HALL		
KG4HSL	DAVID GUICE				
KK4CF	DENNIS PITTS		**- 5 -**		
KK4EM	DONALD THORBURN				
KM4PE	IRVING SPACKMAN	AA5IA	WILLIAM R. SCARBOROUGH		
KO4QN	**HOWARD LOBERT**				
KR4XN	RICHARD STURGIS	**AA5ZZ**	**ROBERT BOUCHER**		
KS4GD	JONATHAN RUTLEDGE	AC5HV	JIM LOVETT		
KX4Y	**DIETER K. SCHLIEMANN**	**AD5L**	**HAL MILES**		
		K5CYE	**CHAL SHRADER**		
N4ASX	RICHARD BUNN	**K5EN**	**DAVE MALLERY**		
N4CU	ROBERT D. WALKER II	K5ENG	CHARLIE KENG		
N4DZP	**WILLIAM ROMIG**	K5EWS	JAMES LINDLEY		
N4HTI	JOEL CASH	**K5GM**	**PETER JORDAHL**		
N4ION	NEIL TAYLOR	**K5IS**	**JEROME DOERRIE**		
N4IOZ	THOMAS GALLAGHER	**K5NRK PB**	**RUSSELL TILLMAN**		
N4KTO	ALBERT CHILD	**K5OE**	**JERRY BROWN**		
N4LC	**KENNETH LEINER**	**K5PER**	**JAMES L. JONES**		
N4LT	**RICHARD D WILSON**	**K5PI**	**ROBERT BRANDON**		
N4MSE	**JEFF L. ALEXANDER**	K5POP	JOHNNY WALLACE		
N4PTS	**JERRY JORDAN**	K5VAS	PAUL STONESTREET		
N4QQ	JOHN SHEW	K5VRF	ROBERT C. SMITH		
N4SC	ROMAN DOWNER	**K5WI**	**BILL WARNER**		
N4SL	STEVE LANGENBECK	K5WO	BOB KMAK		
N4TSV	MARIO DE ARANZETA	KA5AJB	DONALD SWANGO		
NA4N	GREGORY DRZYZGA	KA5QYU	SAM BURNES		
NA4SA	STEVEN SCHINDLER	**KB5YZG**	**CPT ROBERT FELT**		
NB4K	THOMAS BROOKS	KC5DLU	JIM MARKWELL		
NE4I	CHARLES W. FINNIGAN	KC5EJK	ROBERT G. WININGHAM		
W4AD	JOHN O'MARA	KC5IIO	ROBERT LOHRE		
W4AUZ	WILLIAM SHEPHERD	KC5YHZ	MICHAEL BROWN		
W4BAL	JIM BAYLESS	KD5ENA	THOMAS S. CARTER		
W4CZ	WILLIAM D. PRICE	KF5WT	JAMES ALDERMAN		
W4DGE	**DAN MCMILLIN**	KG5OA	DOUG HOWARD		
W4EAT	**CARL STARNES**	KI5AB	STERLING MCBRIDE		
W4EHI	DON GILBERT	KI5OS	DAVID JONES		
W4EPI	**STEPHEN DIGGS**	KM5LY	CHUCK ALLEN		
W4KM	**DEXTER ANDERSON**	N5AF	SAM NEAL		
W4LKL	NEAL BLOCHINGER	**N5ALO**	**BILL HOWELL**		
W4LYZ	CHARLES HUFFMAN	N5BRG	ROBERT S. STRICKLIN		
W4MDF	MILTON D. FORSYTH JR	N5DF	JOHN STENSBY		
W4MVB	**JESSE MORRIS**	N5JOA	JOSEPH FUGITT		
W4NI	RUSS WARD	**N5KUK**	**KENNETH A. BROWN**		
W4OWA	R.W. RUEDISUELI	**N5RRL**	**BOB MOESER**		
W4PED	**CHARLES WRIGHT**	N5TTM	WILLIAM MILES		
W4PID	ROY O. HILL JR	N5UIL	WILLIAM BOURG		
W4PUJ	**RICHARD L. DANIELS**	N5UXQ	MICHAEL RYAN		
W4PZA	DR. ROBERT ROY	**N5XD**	**RON ARNETT**		
W4RI	**PAUL RINALDO**	**N5XYU**	**GLENN FOWLER**		
W4RUX	WES LEITCH	**W5ACM**	**ANDY MACALLISTER**		
W4SCO	LESLIE SCOFIEL	**W5AE**	**JERRY S. STOVER**		
W4SU	JERRY CARTER	W5AR	JOHN GREEN		
W4TE	JAMES KAUTEN	**W5DID**	**LOUIS MCFADIN**		
W4TZG	RAY BURNS	**W5DTR**	**CURTIS R. WILLIAMS**		
W4YUY	PALMER H. CRAIG JR	**W5FM**	**HUGH DAVIS**		
W4ZAA	WENDELL RUSHTON	W5FBQ	BOB HILL		
W4ZY	**ROBERT SCOTT**	**W5FUR**	**NATHAN JANCO**		
WA4AVU	DON DOWNS	W5GEL/W5B	R.N. DOUGLAS		
WA4EWV	AL LEE	**W5GFP**	**GEORGE PIERCE**		
WA4GUK	DAVID PENEZIC	W5GSQ	JAMES SMITH		
WA4MCJ	GUSTAVO DIAZ	W5KQJ	LILBURN SMITH		
WA4SBC	KARL A. EMRICH	**W5LFL**	**OWEN GARRIOTT**		
WA4SCA PG	**ALAN BIDDLE**	**W5LQD**	**HERMAN MIDDLETON**		
WA4SSJ	**RICH TILLOTSON**	**W5NCD PG**	**LARRY BUSH**		
WA4SWJ	EDWARD LONG	**W5NFC**	**GEORGE HARVEY**		
WA4WDL	JOHN FRANKE	**W5RPS**	**KEN WENDEL**		
WB4AKK	KEN HEITNER	W5VHN	WALTER ROONEY		
WB4APR	**BOB BRUNINGA**	**W5VZF PG**	**JIM AKERS**		
WB4FDT	**PHILLIP M. SAGER**	**W5XT/W5YT**	**E. ED ROBINSON**		
WB4FNN	SCOTT MOORE	W5ZUA	RICHARD NORMAN MD		
WB4GCS	JAMES SANFORD	**WA5TWT**	**MIKE SCARCELLA**		
WB4NFB	DR WILLIAM P. PALA	**WA5UNA**	**CLAUDE STEPHENSON JR**		
WB4OBO	JOHN C. JOHNSON				

WA5VRB JOE I. SANDERS
WA5Y RUSS KLEINMAN
WB5AAA JIM BARRON
WB5FLQ CLAUDE WHITLEY
WB5LFO J. GARY SIMS
WB5PKN ROBERT RICE
WB5TPR GERALD KRAUSE
WA5WHN JAY MILLER III
WB5WID C.A. SMITH
WB5ZFG FRANK A. HANSON III
WD5GQM F.B. CROWEDEAUX
WD5HRB WILLIAM E. BODINE
WJ5C BRO EDUARDO BALDIOCEDA
WQ5N STEVE DAKIN
WW5W GERALD ROBISON

- 6 -

AA6CQ DAVID HART
AA6UF THIERRY GUICHON
AB6VU AUSTIN LESEA
K6AT VILLAGES A.R.C.
K6ATN MICHAEL PETERSEN
K6AWO BILL DEWS
K6BDK FRANK J. CARROLL JR
K6CCC JIM WALLS
K6DFY HALE P. FARIS
K6DGW FRED C. JENSEN
K6DUE ROY NEAL
K6DUX IRV ASTMANN
K6ELQ ANTHONY J. SLUPKO
K6GL GEORGE HOPKINS
K6GZ BILL BAUMRUCK
K6IYK JIM FORTNEY
K6JJ JOHN B. GERSBACHER
K6KTS NICHOLAS M. TESTA JR
K6ML JAMES PAQUIN
K6OUE JAMES HARRISON
K6PF ROBERT KOCISKO
K6QB W.B. GRAHAM
K6QXB PS HERB SULLIVAN
K6RFM RICHARD MCALLISTER
K6RTC C. BONINO
K6UI W.R. ADEY
K6UXO KENNETH KERWIN
KC6IIH JOCK SOUTAR
KC6WFU JEFF VOLLIN
KD6AKC MARK LINDSEY
KD6CVL STANLEY SALEK
KD6IRE DON FERGUSON
KD6JWK RICHARD SPELLMAN
KD6PAH JOHN HOPPRICH
KD6WLE HAROLD WILLIAMS
KE6AIF SIEGFRIED JANSON
KE6CQK JOHN RAGLAND
KE6CYU RICH MYERS
KE6HOU HENRY DE KRUYFF
KE6PI RODERICK SCOTT
KF6GAQ GARD FORESTER
KF6NO JOSEPH BRENNAN
KF6QC NEALE FRETHEIM
KG6BQ PB ELMER WINTERS
KH6ABA FREDERICK M. SUGITA
KH6GPI ARTHUR Y. SPRAGUE
KN6GD VINCE G. VITALIE
KN6PE JIM OBERHOFER
KO6BT DUANE NAUGLE
KO6FR RICHARD RAU
KQ6EA JIM JERZYCKE
N6AS PHIL CROSNO
N6EMP BRENT IDEN
N6OO CLAUDE LIEVSAY
N6SHI RONNIE FITCH
N6TE DR. HARRY G. BLUESTEIN
N6TQS DOUG FAUNT
N6TX PAUL SHUCH
N6UPL JAMES DOUGLASS
NE6Y KENNETH ZADWICK
NH6QT RALPH WATKINS
NH6VB HANS SCHELLER
NN6RF DON STIVER
NQ6X BOB WILSON
NT6I ROBERT BRUCE
W6ABN STANLY SAVAGE
W6AQ DAVE BELL
W6ART GLEN AKINS
W6EI PB ROBERT A. IANNUCCI
W6EMC LOUIS WYATT
W6ETK NORRIS NAHMAN
W6FAK VINCE SELF
W6FFH DONALD ERIKSEN
W6FVJ CHARLES MESAK
W6GDM DAVID NEILSON
W6GGM WALTER KELLER
W6GHW LEROY NELSON
W6IHG JERRY PIXTON
W6ISQ JACK TROSTER
W6IT G.D. CAMPBELL
W6JNU AL TOLL
W6KJ RONALD MURDOCK
W6KMB THOMAS COLE
W6MT G.H. FLAMMER III
W6PJ PETE JUUL
W6PYU W.L. WEAVER
W6QYY ROBERT F. LEGG
W6RRK VERNON PRICE
W6RZ RON ECONOMOS
W6STM ARTHUR BAZELL
W6VQ ERNEST BAUMEISTER
W6XD ARTHUR GODDARD
W6XS BOB MCNAIR
W6ZZ G.D. PUGSLEY
WA6EWY B. CHANDLER SHAW
WA6FDI PG ART WHELAN
WA6ILT DAVID REINHART
WA6NEN ELVIN KAPPLER
WA6PBG JERRY STOKER
WA6PUV VIRGINIA PERIAT
WA6WJA DON CROW
WB6BDY STEPHEN WILMET
WB6CYP TULLY BECKER
WB6GVB LEE WONG
WB6NOA GORDON WEST
WB6TIK HOWARD ANDERSON
WB6UZX STEPHEN HAWES
WH6TF NICK LOCICERO

- 7 -

AA7MH PG SHEP SHEPARD
AA7RV KENNETH WEEK
AE7AA HAL BARBER
AL7EB EDWARD COLE
AL7HF FRANK HALL
K7ANG PAUL PRESTON
K7GEX HERBERT ANDERSON
K7OLD NORMAN MARTIN
K7OPA RON MILLER
K7ROD RODNEY HUNTER
K7RR CLIFFORD BUTTSCHARDT
KA7NEW MORRIS HAZEL
KA7QEN CHUCK GOLLNICK
KB7DE W.R. CUTTER
KB7PPP DAVID BURCH
KB7WAU DALE JORDAN
KC7DBA STEPHANIE STEELE
KC7EMC THOMAS LIANG
KC7JOV GILES SYDNOR
KC7JRU SAMUEL LYNCH
KC7NYI KEN WEATHERSBEE
KC7QWT MICHAEL BOLAND
KC7RYP ERIC COOK
KF7JU DWIGHT CASH
KK7AC ANDREW H. SMITH
KK7P LYLE V. JOHNSON
KL7BJV ALFRED APODRUK
KL7CPO LEE PITTS
KL7CQ WILSE MORGAN
KL7HLR WILLIAM DUFFY
KL7IFW MICHAEL BROOKS
KL7IZZ HARLEY STEWARD
KL7JHX HARRY SEARLES
KM7Y PATRICK KELLEY GARRETT
N7AR ARTHUR READE
N7BFS DOUG COLE
N7BRJ GARY MEMORY
N7CL ERIC GUSTAFSON
N7DCS GIL BRENTLEY
N7EM RON SEFTON
N7EQF ALBERT E. OZIAS
N7NXV DENNIS HEDRICK
N7OLS BILL STILES
N7PIB SANFORD SMITH
N7PMO BRUCE ELLEFRITZ
N7RYQ WILLIAM VESSER
N7UB PG ALBERT L. ZOLLER
N7WMM BILL FENNEMORE
N7WS WES STEWART
N7ZEV FRANK KOSTELAC
NX7U SCOTT TOWNLEY
W7AMQ GALE B. SELLS
W7BUN JERRY SELIGMAN
W7ER CLIFF BRUCE
W7FGQ PG R.H. KNAACK JR
W7GBI CHARLES JUSTINAK
W7GHZ MICHAEL PINAULT
W7IXL DALE KIND
W7JYJ LAURENCE LAITINEN
W7KCJ R.W. ANDERSON
W7KTS DAVID MOFFORD
W7LB PS LARRY BROWN
W7LVN JAMES C. WALSH
W7QLC PETER ROMANS
W7RT RICHARD TANNEHILL
W7TX KENNETH MACLEISH
W7UG JAMES DEVRIES
W7UK WALLACE TRAVER
WA7HVB MARTIN W. BERG
WA7PIB CARL ANDERSON
WA7QFR PS REN RODERICK
WB7OAF VICTOR BOLSTAD
WB7PMS WILLIAM M. GRAHAM, III
WB7QKK BILL MASTIN
WB7RMB BEN MICHEL
WF7S BILL DALRYMPLE
WL7BQM MIKE WEST

- 8 -

AA8ON CONRAD PHILLIPPI
AA8UU JOHN TEAGARDIN
AC8W STAN ARNETT
AI8T H. ALLAN JR.
K8AJX FREDERICK BEATTY
K8BGZ DAVID MAIER
K8CJ CHARLES J. BARONE, MD
K8EME LUIS G. ORTIZ
K8EQ JACK SPIES
K8JW/3 JOHN K. WILLIAMS
K8LIX BERNARD W. JOSEPH
K8NIA STEPHEN SEBESTA
K8OCL JOHN CHAMPA
K8PNW THOMAS L. MILLER
K8RQ JAMES JAEGER
K8YMI ROBERT HALLEY
KA8ABR MICHAEL P. MURPHY
KA8QCU DOUGLAS KUITULA
KA8ZLA DAVID BACKUS
KB8EMH SMITH BREWSTER
KB8FAC JOHN STUMPF
KB8LEF JOSEPH SENGER
KB8SWX WILLIAM PHILLIPS
KB8VAO STEPHEN GOCALA JR

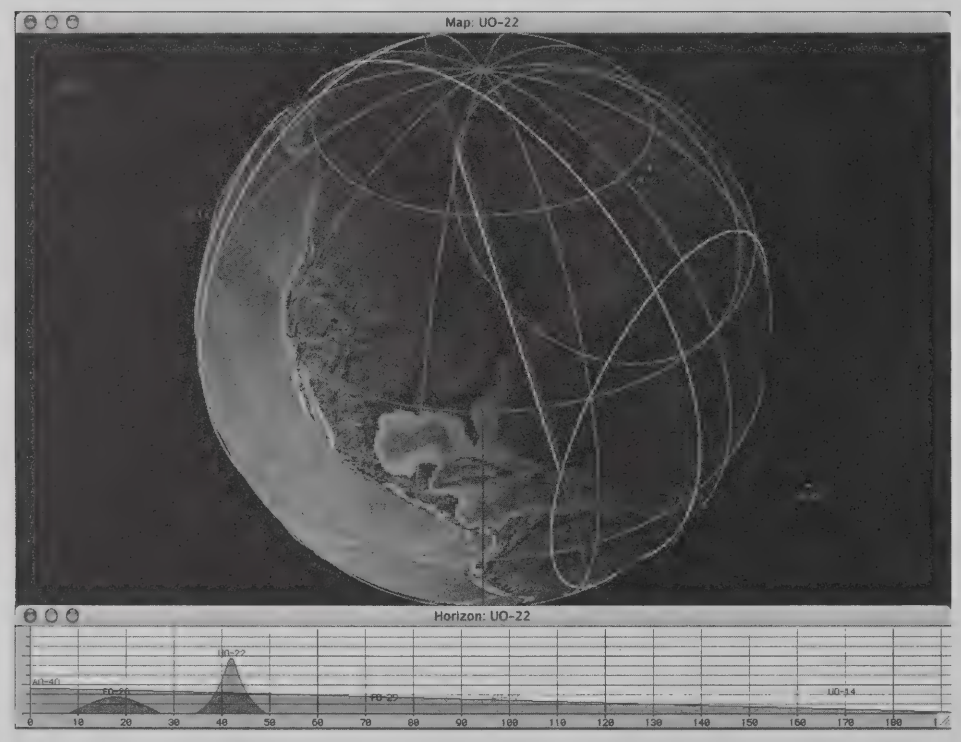
KC8LDO	LELAND SCOTT
KC8LTD	BARNABY LINET
KC8RAN	JOE PROKOP
KE8RG	**JOHN DECKER**
KI8G	JAMES BURDICK
KR8L	**WILLIAM PARMLEY**
N8AHK	TIMOTHY STOOKEY
N8AYY	GARY WIDMAYER
N8DEU PS	**TIMOTHY CUNNINGHAM**
N8GHZ	JOHN O'HARA
N8GNA	TOM NUYENS
N8GZL	**EDWARD ROJOWSKI**
N8IFU	MARK J. YERGIN
N8IGJ	**ARMANDO MERCADO**
N8JCX	DAVID LENNIG
N8JUC	JOHN MELCHER JR
N8LM	LEIGH MATTHEWS
N8NOQ	**RICK NEMER**
N8NQF	RON SPAULDING
N8OCX	BROOK D. SMITH
N8WL	STEVE KATZ
N8XCX	ROBERT WESTBY
N8XKZ	MICHAEL RADWICK
NE8I	**LLOYD ELLSWORTH**
NO8D	**PAUL SERGI**
W8BKO	ROBERT ADAMS
N8FI	MICHAEL FIELDER
W8DVI	FRANK MAGYAR
W8GQW	WRAY DUDLEY
W8GSM PG	**GUNTHER MEISSE**
W8IMF	**DONALD ALTMOS**
W8ISS	JAMES FRENCH
W8JE	TERRY JONES
W8KSW	WALT EVANYK
W8LIL	BILL (W.J.) NEWILL
W8MAO	HERBERT LAUBER
W8VPV	CUYAHOGA FALL
W8WTS	JAMES GALM
W8XF	MORRIS MCMILLIAN
W8YH	**GEORGE REAZER III**
W8ZCF	FARRELL WINDER
W8ZSX	**ROBERT TEMPLIN**
WA8CBA	**ROBERT BIGGS**
WA8FJK	GREGORY CROSS
WA8FKC	ANDREW SZUCS
WA8HFY	**PETE GIBLIN**
WA8TON	JOHN WASCIUK
WA8WDQ	**BRAD NOBLET**
WA8ZLK	ANDREW J. BRINCKO
WB8HRO	TIM CONROY
WB8OTH	PERRY YANTIS
WB8SBI	**JAY SCHWARTZ**
WB8ROK	EDWARD STEVENS
WB8WUP	RICHARD KATSCH
WD8CDP	**JIM BROWN**
WD8QCN	**STEVE JACKSON**

- 9 -

AA9GY	PAUL HISE
AA9KH	**JAY P. JENKINS**
AJ9P	ROBERT HALBMAN
K9BMC	**DON BRISSON**
K9BPT	JOSEPH L. DEARTH
K9EIF	**WILLIAM FRANKLIN**
K9EK	EDWARD KROME
K9HF	PATRICK MARINEAU
K9IMX	DAN SMITH
K9KB	KENNETH BRANNING
K9KK PB	**RICK VIDMAR**
K9LF PG	**WILLIAM G. BROWN**
K9MWM	**BOB LUDTKE**
K9OPO	ROGER A. GRADY
K9REO	**JAMES LATTIS**
K9RY	RAYMOND BAKER
K9SB	TIM TOMLJANOVICH
K9SG	**GARY STOUDER**
K9SLQ	WAYNE GROVE
K9XO	JOHN LAN
KA9ETP	EDMUND F GAFFNEY JR
KA9LRE	JOHN K. OBER
KA9PZQ	BERNARD HALPERN
KA9ZIM	DANIEL GACEK
KB9MGX	MIKE LOWE
KB9OZH	WAYNE M. BERGAMINO
KB9PIE	JOHN T BELL
KB9RQZ	**MARK MORGAN**
KB9SCU	DAVID MARKEY
KB9WCA	CARL PETERSON
KB9WEK	MIKE SEHNER
KB9WWS PG	**NICHOLAS LAUERMAN**
KF9YK	GEORGE LAZARUS
N9BBM	MICHAEL MCGINLEY
N9DG	DUANE GROTOPHORST
N9ETD	CRAIG GOLDBECK
N9IP	STEPHEN BELTER
N9KLM PS	**MICHAEL BLAKE**
N9ML	BUD SMALL
N9RPU	LLOYD VANDERVORT
N9TD	ARTHUR KRATZ
N9WYO	**GLEN OGLE**
N9ZGE	DONALD WILSON
NE9Z/7	WILLIAM G. RINKER
W9AE	**WAYNE ESTES**
W9CBS	RAYMOND F. KAAS
W9DKT	AUSTIN G. ANDERSON
W9EVT	GEORGE ULM
W9EVZ	ARTHUR NATION
W9FBC	MAURICE J. MEAD
W9FOZ	ROBERT FLINN
W9FRU	ROBERT BLANEY
W9GB	**GREGORY BEAT**
W9GIG	**GEORGE ISELY**
W9GX	GREGORIO CATUNCAN
W9GYC	MIKE FREITAG
W9HOQ	**LAMARS LIBERTYVILLE**
W9IF	RICHARD PARRY
W9INE	LARRY A. OLSON
W9JIU	JOHN PATTERSON
W9JUV	**JOE SCHROEDER**
W9KFB	RON COX
W9OER	FREDERICK HAINES
W9PD	PATRICK DALEY
W9RNU	JOHN SPINDLER
W9VCI	**ANTHONY J. RICH**
W9WDN	**JOSEPH GLICKAUF**
W9XA PG	**KERMIT CARLSON**
W9YCV	LESTER A. PETERSON
WA9AFM/5	**THOMAS WEBB**
WA9BST	**DAVID B. LIEB**
WA9JTX	**JAMES E. OPDYKE**
WB9ANQ	BRUCE A. RAHN
WB9CER	D.L. TIMMERMAN
WB9EXL	RON PETERS
WB9FRV	KENNETH VAN ANDEL
WB9FUV	TARECK ELASS
WB9JXE	ROGER BONUCHI
WB9QNJ	THOMAS TROIKE
WB9SMM	**JOHN LEEKLEY**
WB9ZLM	WILLIAM TATE
WD9DEX	GREG OVERKAMP
WI9WI	JIM FITZPATRICK

- 0 -

AA0KO	GREG O'NEILL
AA0XJ	JAMES COVINGTON
AB0CV	RICHARD HOOVER
AB0DO	**TIMOTHY SALO**
AB0NJ	FRANK RODEFFER
AB0OD	**ROBERT B. MCCOWN**
K0BRO	**RONALD R. WOOD**
K0CY	BOB MCCAFFREY



MacDopplerPRO

Radio Doppler, Rotor control, OS 8.6 to OS X,
simply the best satellite tracking software for Macintosh

http://www.amsat.org
martha@amsat.org
850 Sligo Ave.
Silver Spring MD, 20910-4703 USA

http://www.dogparksoftware.com
info@dogparksoftware.com
Voice: (301) 589-6062
Fax: (301) 608-3410

K0GEO	**JAY CLOSE**
K0GRM	**DENNIS MURPHY**
K0GS	**GEORGE H. SAUM**
K0IBS	JOHN JOHNSON
K0IQE	**ALVIN GLUSICK**
K0IQR	BOB EVANS
K0MDJ	**MARK JOHNS**
K0NET	GARY RATTERREE
K0OV	JOE MOELL
K0RDT	**DR. ERNEST W. HOUSE**
K0RJS	RON MCCULLEY
K0RL	RON LILE
K0SBH	JAMES WELLINGHOFF
K0VM	**ALVIN GROFF**
KA0OJH	**ALAN C. FIELD**
KA0SWQ	RICHARD AGNEW
KB0BVR	RANDY GREEN
KB0EMR PB	**RICHARD ECHTERNACHT**
KB0EVM	DAVID HANSON
KB0QDT	WYATT LYON
KB0QHZ	JOSEPH BETROS
KB0TCS	DR MATTHEW DIOMEDE
KC0EOE	PHIL MEHALKO
KC0HNI	PATRICK S. O'REILLY
KF0QS	BERNIE POSKUS
KI0AG	**CHARLES DUEY**
KY0DR	DAVID RUSH
N0BYF	FLOYD ROMSLO
N0DMT	**STEVEN FORNEY**
N0EFW	WARD E. CULBERTSON
N0FKU	RANDY WENDEL
N0GHY	JOEL MYERS
N0IVN	RON HRANAC
N0JY	JERRY BUXTON
N0KMA	BILL MORRISON
N0LBG	HARVEY DIEHL
N0MTO	CURTIS L. VOGT
N0NCI	CHRISTOPHER WRONSKI
N0NTX	THOMAS L. MCDANIEL
N0OKW PG	**EDWARD ZIMMER**
N0PFF	MIKE KOENIG
N0RUX	GEORGE KRETKE
N0UHJ/N0V	J. & E. YANKO
N0UU	LAWRENCE STOSKOPF
N0VSE	JOHN GUBBINS
N0WB	BILL BECHTOLD
N0YFL	MARK SELIGER
N0ZBV	ERIC ELWOOD
N0ZIZ	DANIEL REED
NB0Z	JAMES KEW
NF0K	**FRANK KARNAUSKAS**
NJ0C	**JOHN CONNER**
W0BPP	WILLIAM H. SELL
W0DQY	GLENN SMITH
W0ENB	NORBERT SANTOSKI
W0FM	**TERRY SCHIELER**
W0HJX	SAMUEL SELDERS
W0JDB	JERE D. BRUNING
W0JHS	PHILIP DEJARLAIS
W0LCP	FLOYD R. PATTEN
W0NFW	DR. GEORGE D. LEHMKUHL
W0PEC	NELS E. KNUTZEN
W0QZZ	WILLIAM GRAVES
W0RPS	**RICHARD SULLIVAN**
W0RSJ	W.T. MURPHY
W0SAT	JERRY EHLERS
W0VO	ED MEANS
W0WGZ	**ARNOLD BUCKSBAUM**
W0YPT	**TELMER OLSON**
W0ZWW	**JOHN L. HILL**
WA0CTZ	DAVID MICHAEL
WA0DCB	JOHN M. CONLEY
WA0YQM	**LARRY EKER**
WB0FTL	LESLIE ELLIS
WB0IZY	**R.C. CARTER OVERLAND**
WB0JZX	THOMAS E. WULLING
WB0SOK	RON JONES
WB0ULX	**LLOYD V. TIMPERLEY, JR.**
WC0Y	WARD HALL
WG0H	KALE GENTRY
WG0I	MICHAEL T. HARTMANN
WK0U	CARL RALLS
WT0M	**GREGORY HINE**
WY0C	CLINTON GRIEVE JR

No Call Sign Provided

PB	**CLAUDE BOUSSEMART**
	WILLIAM CARRICO
	DAVID ECKHARDT
	CATHERINE C. FARLEY
	CARL FLAHAVEN
PS	**CLAIR FOWLER**
	MR. PH. FOUQUEMBERG
	RONALD GEYER
	ISIDORO HERNANDEZ
	ZUU-CHANG HONG
PB	**THOMAS O. JELKS JR**
	DENNIS KELLY
	BIRGER LINDHOLM
	GREGORY T. MARTENS
	THOMAS MAY
	ATILANO DE OMS
	DAVID PETRILLI
	JOHN PORTELLI
	ALLEN J RANDALL
	HELEN REED
	RICHARD H. ROBERTSON
	ANDREW ROMER
	MARY CATHERINE ROMER
	WILLIAM & JOAN ROMER
	DON SANFORD
	CHARLES & KIM SCHMIEDER
	ARI SEZIONE DI TORINO
	GORDON WOODCOCK

CANADA

VY1RT	RONALD TULL
VE2BPD	JEAN-NICOL DUBE
VE2ME	**LARRY TOULCH**
VE2RM	VE2RM INCORPORATED
VE2ZAZ	BERTRAND ZAUHAR
VE3BCG	GEORGE BURR
VE3BNO	MR. G. ROACH
VE3CZI	NORMAN FREIDIN
VE3DHL	KEITH BENTLEY
VE3EFF	JEFF MILNE
VE3ELD	WILLIAM D. SCHULZ
VE3EP	JOHN HOLDEN
VE3FFK	MIKE KELLY
VE3FRH PG	**ROBIN HAIGHTON**
VE3FUL	H.E. KING
VE3GDX	MR. M.S. RUTTAN
VE3HOL	DONALD TAMBEAU
VE3KNG	ROBERT JAMES HAWLEY
VE3NPC PS	**L. CLARE FOWLER**
VE3PRD	NEIL LAHAISE
VE3PYG	DAVID STEPHENSON
VA3RR	RUSS RENAUD
VE3SHO	SYLVAIN HOULE
VE3ZJZ	JORDAN CRAIG
VE4AMN	GREG MASON
VE5OA	SLATER TUBMAN
VE5VP	VAL F. PESTYK
VE6AXL	ERNEST LUPACK
VE6NM	E.W. SMITH
VA7GZ	FRED ZELTINS

SSB ELECTRONIC USA

PHASE 3D Equipment Headquarters

SSB Electronic USA features world class VHF - UHF - SHF equipment. The latest gear from: SSB Electronic, Kuhne Electronic - DB6NT, M2 Antennas, Beko Electronic, EME, Procomm, AIRCOM PLUS, AIRLINK, ECOFLEX and WINRADIO is available.

- Mast Mounted Preamplifiers 144 - 2400 MHz.
- Ultra Low Noise LNA's 50.0 MHz. 24.0 GHz.
- Transverters 50 MHz. - 24.0 GHz.
- Antennas - Rotors
- Downconverters and TX Upconverters for all P3D frequencies
- Mode "S" Downconverters
- Mode "L" TX Upconverters
- Linear Amplifiers 50 MHz. - 24.0 GHz.
- Ultra Low Loss Coaxial Cable
- Transverter Kits 1.2, 2.4, 5.7 & 10 GHz.
- Parabolic Dishes

So What's New ?

BEKO Electronic: **144 MHz. - 1296 MHz. Linear Amplifiers 100 Watts - 1200 Watts**

DB6NT Electronic: **MKU 24 OSCAR** Mode "S" Downconverter IF 144 or 432 MHz.
MKU 10 OSCAR 10.451 GHz. Down Converter
MKU 24 G2 OSCAR 2.4 GHz. Transverter 1 Watt
MKU 57 OTX 5.6 GHz. OSCAR TX Upconverter ***plus more.....***

ECOFLEX - LLC **Super Flexible Low Loss Coaxial Cable**

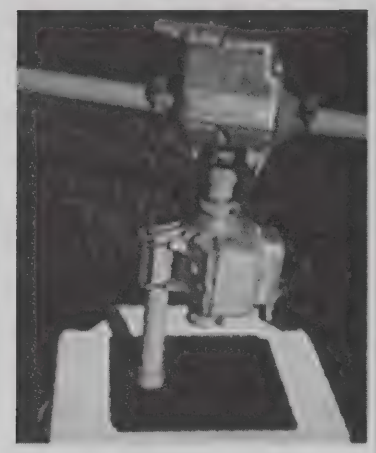
SSB Electronic: **UEK-3000SAT** Mode "S" Downconverter IF 144 or 432 MHz.
UTM-1200 DLX Mast mounted 1269 MHz. 15 Watt TX Upconverter
UTM-1200-1 1269 MHz. 1 Watt TX Upconverter
SP-2000 & SP-7000 Heli-Filtered Mast-Mounted Preamps ***plus more.....***

SSB Electronic USA

For complete specifications and prices, please visit our WEB SITE: **www.ssbusa.com**

Phone 570-868-5643
New Hours: MTWTFSS
9:00 AM - 11:00 PM

124 Cherrywood Dr.
Mountaintop, PA 18707



Processor box

A Low-Cost Az-EL!

Azimuth-Elevation Rotor System with Control Processor and Windows® driver software!

As seen at the Dayton Hamvention 2002

Jim (VE5FP) Koehler's Version 2 Az-EL

Just what you need for AO-40, at a fraction of the cost of other Az-El's. Uses sat pass data exported by *InstantTrack®* or *Nova for Windows®*!

All solid state switching for improved reliability. No relay contacts to arc or get dirty. Not a kit. Complete with Control Processor and Windows® interface Software. Comes with two rotors, "T" coupler, power supply, Windows® driver software, and tabletop stand.

Sale Continues: $398 + S&H

Visit our website: www.satelectronics.com

SatEL Satellite Electronics for Amateurs

703 Franklin Drive, Brentwood, CA 94513

(925) 513-1597, fax (925) 513-1797, kr6ke@amt.net

VE7AFY	MR. & MRS. R. DARCUS
VE7AHX	PETER ROGERS
VE7BZC	MR. NORMAN R. BARTON
VE7CZL	THOMAS MANN
VE7JNJ	FREDERICK COOPER
VE7XO	RUSS BURMEISTER
VE7YQ	DON BYRNE
VE9PI	JAMES C. DUNFIELD
VY1RT	RONALD TULL

DX

6EI	ROBERT A. IANNUCCI
6Y5HB	MR. HUGH R. BRAND
8GUS	RONALD LONG
9M2OK	OTHMAN ISMAIL
9V1VS	T.K. JAYARAM
BV1AF	EDWARD CHUANG
BV2OL	YAO-PIN TSAI
CT1EOJ	LUIZ DUARTE LOPES
D4UFC	RUSSELL PETERSON
DC3ZB	PER MALMBAK
DG5FFN	DANIEL KOCH
DH5IAE	BERND LUDEWIG
DK1TB	ERICH EICHMANN
DK2ZF	ROLF NIEFIND
DL7KK	MR. K.J. PROTZE
DL8DF	MR. RUDI SCHOENBERGER
DU3NXE	CHARLES KRESGE
EA3ACI	FREDERIC CASAL
EA3OG	MR. LUIS A DEL MOLINO
EA4LE	ANTONIO FERNANDEZ
EA8HZ	PABLO CRUZ CORONA
F1GRR	ETIENNE ALBERT
F5OYD	MR. JEAN-LOUIS MARIDET
F6BEM	YVES MICHELET
F6BKI	JACQUES RAMBAUD
F6HTJ	MICHEL RESPAUT
FE9NB	PIERRE OGER
FK8AH	MR. ROBERT GARBE
G3COJ	A.H.B. BOWER
G3RUH	JAMES MILLER
G4DPZ	DAVID A JOHNSON
G6LVB PG	**HOWARD LONG**
G6XYA	DR. D.E. CLARK
G8DQX	R.A. GAPE
G8SPE	BOB ARMSTRONG
GW1FKY	KENNETH JOHN EATON
HB9ABO	MR. URS HADORN
HB9AUS	MR. FABIO LAVA
HB9BKD	ALFED KAUFMANN
HB9CQK	FREDERIC FURRER
HB9CXE	EMIL WALDER
HB9IBI	FRANCOIS BURRI
HB9MAD	MR FABIO M ROSSI
HL5PME	SU RYONG CHO
I1CDB	MR. PIETRO FANCHIN
I1TEX	MR. MICHELE SENESTRO
I5ISF	ISERANI TURIDDO
IK1UWL	GIORGIO MARCHI
IK2AXV	PIETRO DELBONO
IK2HKS	GILBERT MARAZZINI
IW1CBG	ALFREDO PAVARINO
IW1PED	MR. MAURIZIO RIVAROLA
IW5BSF	ROBERTO BUTORI
JA1ANG PS	**MR. HARUO YONEDA**
JA1BLC	FUMIHIKO YOSHIMACHI
JA3GEP	MIKIO MOURI
JA3TDW	FUMIO ASAI
JA6BX	YOSHIO ESAKI
JN1GKZ	MASAHIRO ARAI
LA4GF	FRODE GALTUNG
LA7AE	MR. ROLF EVENSEN
LA8YB	MR. FINN JENSEN
LU3EEC	FRANCISCO VIEGENER
LU5ALG	RAUL U. BON FOSTER
LW2DDS	NESTOR SCHMIDT
LX9AI	DR. JOSEPH LAHR
OE1JIS	JOSEF MAIER
OE1VKW	DR. VICTOR KUDIELKA
OH2HK	MR. REINO JANHUNEN
PA0GJA/DL	MR. W.H. ENDLICH
PA3FDM	HEINRICH VAN DER GEUGTEN
PE1CRC	MR. HANS G JANSSEN
PE1ITR	ROB HARDENBERG
PT2TD	FRANCISCO ROGERIO
PY1AT	RAUL MARCOS
PY1BDU	MR. WALTER PONTES
PY2FUS	RONALD JACQUES
PY7EI	FRANCISCO LAPENDA NETO
SM0KWH	MR. ROLF H. LICKFETT
VK2ZAZ	MR. GEOFFREY RADCLIFFE
VK3DTO	MR. A. SQUIRES
VK5APF	PETER FORWARD
VS6HS	MR. VICTOR SUNG
YV5AMW	GUSTAVO HERRERA MARCANO
ZL1AOX	MR. IAN T. ASHLEY
ZL1BNG	NEIL JOHN ORTON
ZL1TRE	MARK SHEPHERD
ZL1WN	MR ROSS BIGGAR
ZL2HV	NZART
ZL2UYH	NORMAN GUSSCOTT

Corporate, Organizations and Other Sponsors

ADDISON CTY ARC
AKRON CHAPT 39 QCWA
AMSAT SAN
BERNARDINO
AMSAT-UK
AMSAT-ZL
BURLINGTON A.R.C.
CENTRAL STATES VHF S
CLEMENTS FAMILY CHT
KENWOOD COMMUNICATIONS
MIDWEST VHF/UHF SOCIETY
NEW PROVIDENCE ARC
OTTAWA A.R.C.
RIPLEY CNTY REPEATER
S.MILWAUKEE A.R.C.
SIERRA AMA RADIO CLB
SKYWIDE ARC
SOUTHEASTERN VHFS
WEST AUSTRALIAN VHF GROUP

Again, thank you for your continued generosity, support, and team work!

20th Space Symposium & AMSAT-NA Annual Meeting
7-11 November 2002
Lockheed Martin Recreation Area, Fort Worth, Texas

Hotel: AmeriSuites of Fort Worth Cityview, 5900 Cityview Boulevard, Fort Worth, TX 76132. Telephone: 817-361-9444. AMSAT Group Rate: $75 + taxes by 16 October 2002.

Transportation: To/From Dallas/Fort Worth (DFW) International Airport to Amerisuites: Rental Car, Super Shuttle, or Bus/Train/Taxi Combination. See AMSAT Web page for further details. Free shuttle between AmeriSuites and Lockheed Martin Recreation Area.

Airlines: Principal carriers to/from DFW are American Airlines and Delta Airlines. Many other carriers also serve DFW and competitive fares are available.

Schedule:
Surplus Store Tour: 07NOV02
Technical Programs, Annual Meeting, and Banquet: 08-09NOV02
Field Ops Breakfast: 10NOV02
Lockheed Martin Aeronautics Company Tour: 10NOV02
AMSAT-NA Board of Directors Meeting: 10-11NOV02

Family/Spouses Programs: A full slate of programs is being planned for 08-09NOV02. Fort Worth offers excellent art museums, the recently opened Cowgirl Hall of Fame, the famous Fort Worth Stockyards, the Bass Performance Theaters, Sundance Square, excellent shopping malls, and other attractions. See AMSAT Web page for details as they are finalized. Indicate below if you are willing to participate in these programs.

Description	Cost	How Many?	Amount
Registration (*Includes Conference Proceedings*)			
Until 16OCT02	$30.00	_____	_____
After 16OCT02	$35.00	_____	_____
At the Door	$40.00	_____	_____
Saturday Night Banquet	$30.00	_____	_____
Make checks payable to AMSAT-NA in $US		**Total**	_____
VISA/MS (only):		Exp Date:	

Print Name: _____Call:_____

Print Name: _____Call:_____

Print Address:_____

Print City: _____State or Prov_____

Print Zip/Postal Code_____Country_____

Daytime Telephone: _____

Do you have an interest in Family/Spouse programs? Yes/No
Send to AMSAT-NA, 850 Sligo Avenue, Suite 600, Sliver Spring, MD 20910-4703

Field Ops Update: 2002 Dayton Hamvention Highlights

Barry A. Baines, WD4ASW

AMSAT enjoyed another successful weekend at the Dayton Hamvention. Thanks to the efforts of our cadre of dedicated volunteers who manned the AMSAT booth, made Forum presentations, and assisted with setup and takedown of our exhibit, AMSAT had a very strong presence at this year's Hamvention. While the weather was not entirely cooperative, interest in AMSAT activities was very high and booth activities were very busy.

Highlights of this year's Hamvention included:

• AMSAT benefiting from several donations to support a 'membership incentive' at Hamvention. For the first time, we offered two incentive awards. Spectrum International donated a Uni-Trac 2000 and the Grand Prize was a Kenwood TH-D7A(G) dual-band HT and Arrow Antenna which creates a hand-held satellite station. Total new member and membership renewals handled at Dayton totaled over 200.

• The AMSAT Forum on Saturday morning was a resounding success. Presentations were made on AMSAT's newest projects (AMSAT OSCAR-Echo and Project Eagle), receiving AO-40 transmissions, and a review of SAREX (Shuttle Amateur Radio Experiment) featuring the comments of two shuttle Amateur Radio pioneers, Dr. Owen Garriott, W5LFL and Dr. Tony England, W0ORE. Dr. Garriott and Dr. England were recipients of the 2002 Dayton Hamvention Special Achievement Award for pioneering Amateur Radio in space.

• Through the efforts of key individuals, AMSAT had updated publications and materials at Hamvention. Gould Smith, WA4SXM rewrote the *Analog Satellite Guide* and *Digital Satellite Guide* for the Hamvention. Mike Seguin, N1JEZ updated the *Working the Easy Sats* and the *AMSAT Resource Guide*. Mike also developed a new *AMSAT Frequency Guide* featuring a new format and containing the latest frequency and mode information on operational amateur radio satellites.

• This year's AMSAT theme at Hamvention was *AMSAT: On the Horizon* which featured the development of the OSCAR-Echo and Eagle projects. Rick Hambly, W2GPS provided the AMSAT Microsat mechanical test model used for vibration testing in the development of AO-16, DO-17, WO-18, and LU-19 as well as delivered an engineering mockup of the AMSAT OSCAR-Echo. Rick gave a brief presentation on OSCAR-Echo at Saturday's AMSAT Forum. We also had the thermal model of PCSat (NO-44) that was provided by Bob Bruninga, WB4APR as well as Bob's portable 'umbrella dish' for 2.4 GHz on display.

• Once again, products available at the AMSAT booth included SSB's UEK-3000 2.4 GHz downconverter and Arrow Antenna, which is a very popular antenna for use with the LEO FM satellites. Steve Diggs, W4EPI made several demonstrations during Hamvention using the FM satellites utilizing this antenna.

• The AMSAT dinner on Friday evening at the Amber Rose Restaurant was very well attended. For the second year, there was a program after dinner. This year's speaker was Bob Bruninga, WB4APR who highlighted new developments in APRS.

• Several very successful satellite demonstrations were conducted on Saturday morning following the AMSAT Forum. Howard Long, G6LVB had a crowd of over 65 people viewing his portable AO-40 ground station located in the Hara Arena parking lot as he made several contacts. Meanwhile, Mike Seguin, N1JEZ had his 24 GHz receiving station setup near Howard's and was successful in receiving the AO-40 beacon with his equipment. For almost everyone present, this was their first opportunity to hear AO-40 on 24 GHz. Steve Diggs, W4EPI also worked UO-14 on two different occasions which was well received by newcomers anxious to hear a LEO satellite using a handi-talkie and hand-held Arrow antenna.

The logistical challenges of preparing for Hamvention have evolved over the years to the point where a standard process is applied and key team members are aware of what needs to happen when. However, this doesn't mean that everything is the same from year-to-year. This year, for example, a new hotel was utilized in order to help control hotel costs for our volunteers. Ed Collins, N8NUY found the Hope Hotel, located in Fairborn by Gate 12A of Wright Patterson AFB. Ed also served as our new 'UPS recipient' as he received all of the AMSAT packages that were shipped from various parts of the country in preparation for

Dr. Owen Garriott, W5LFL Frank Bauer, KA3HDO and Dr. Tony England, W0ORE in front of the ARISS display at the AMSAT booth. Frank is VP-Human Space Flight for AMSAT-NA. Owen and Tony are recipients of the 2002 Hamvention Special Achievement Award.

Hamvention. Two new volunteers, Nancy Makley, KC8GYW and Dave Misek, N8NPX served as coordinators for the AMSAT Dinner at the Amber Rose Restaurant, handling both the meal selection (in consultation with Martha) and dinner reservations. Steve Thompson, K5PK worked out arrangements for a new golf shirt, t-shirt, and patches by designing the new patch and then coordinating with the shirt manufacturer the production of these items.

Setup of the AMSAT booth in our traditional location (445-448) took place on Thursday, May 16. Robin Haighton, VE3FRH, Ed Collins, N8NUY, Barry Baines, WD4ASW, and Ken Chafee, WA1QXR loaded the rental van at our storage locker where Ed had accumulated the various packages as well as stored the booth display items. Prior to Hamvention, Ed had also done some repair work on the drawers and other items that are part of our booth display. At Hara Arena, we proceeded to put everything together. Meanwhile, Martha Saragovitz arrived from Washington, and Keith Pugh, W5IU and the group from Ft. Worth arrived in Keith's van. They assisted with computer setup, hanging the various banners, and organizing the myriad of items available. Dave Bern, W2LNX, arrived late Thursday afternoon with the ARISS display which he had transported from Washington. This was the same display that was used at the Smithsonian Air & Space Museum during the premier of the new IMAX film on the International Space Station. Rick Hambly, W2GPS arrived with the Microsat engineering model as well as the engineering mockup of AMSAT OSCAR-Echo.

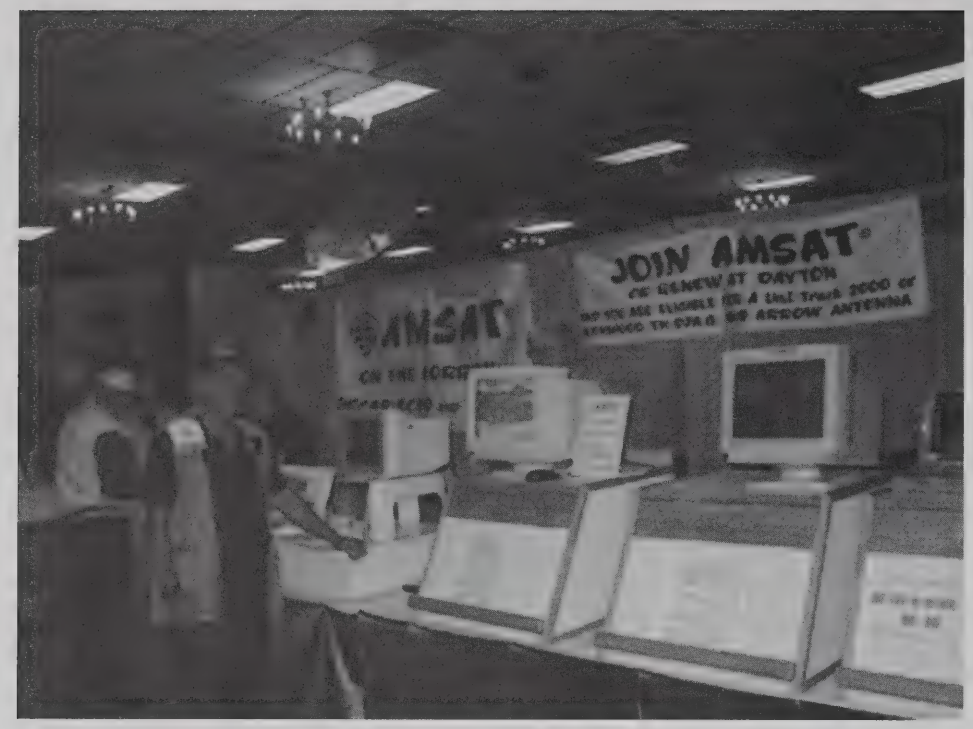
Thursday evening members to socialized at a 'pizza-n-suds' gathering which was coordinated by Ed Collins, N8NUY. This was the first time that a formal AMSAT gathering took place on Thursday evening and was held at Marions's Pizza in Beavercreek. That same evening, Kenwood held its annual reception, which was attended by several hundred dealers/retailers, various organization officials, and hams. Barry, WD4ASW was given a few minutes to briefly highlight AMSAT, the status of the new projects that are currently underway, and AO-40.

Hamvention opened promptly at 0900 hrs on Friday morning with that day's session closing at 1800. With a crew of over 20 AMSAT volunteers to help man the booth during the three-day event, we were well staffed to handle the requests of everyone who stopped by the booth. Along with the membership renewals and new memberships, our volunteers were busy handling the demand for software (Nova, Quiktrak, Instant Trak, WiSP, MacDoppler Pro, etc.), books (including the latest revisions of Analog Operating Guide and Digital Satellite Guide), satellite fashions (golf shirts, t-shirts, patches), and miscellaneous items (Updated Laminated Frequency Chart, an ARISS CD-ROM, AMSAT Journal on CD-ROM). The booth also featured some interesting display items, including the mockup of OSCAR-Echo, the original Microsat Test Model, and thermal model of PCSat (NO-44). Bob Bruninga, WB4APR, provided the latter unit. Also on display was Mike Seguin's 24GHz receiving system (on tripod) along with Bob Bruniga's portable 'umbrella' S-band antenna.

Dr. Owen Garriott, W5LFL (L) and Howard Long, G6LVB (R)

Based upon the success of prior years,

Dave Bowman, G0MRF holds one his S-band to 28 MHz downvconverter kits. On the left is Steve Diggs, W4EPI and on the right is Steve Gocala, KB8VAO. W4EPI and KB8VAO served several tours of 'booth duty' at the AMSAT booth.



The AMSAT Booth in location 445-448 featured displays of ARISS, AO-40 antennas (Mode-K), satellite tracking. Mal Preston, NP2L (with the AMSAT hat) assisted in demonstrating satellite tracking hardware while Bob Carpenter, W3OTC (behind the CRT) assisted with memberships and other administrative matters during the weekend.

AMSAT once again had the Arrow Antennas available at the booth. We also had the SSB UEK-3000 Mode-S Downconverter. Most of the Arrow Antennas were sold during the course of Hamvention. Sales of the UEK-3000 reflected continued interest in AO-40. Another item that did surprisingly well was the venerable Kansas City Tracker-Tuner. Production of this item has now ceased and AMSAT is now offering the last production run of KCT. Several were sold during Hamvention as buyers wanted to make certain that they obtained one before the existing supply sold out.

A key factor in Hamvention is the opportunity to greet old friends, meet new ones, and provide and opportunity for the AMSAT membership to meet the officers and Board Members who attended Hamvention. AMSAT President Robin Haighton, VE3FRH, held scheduled 'office hours' during the course of the Hamvention at the AMSAT booth so that people could talk to the President about whatever was on their minds. Many AMSAT members stopped by to say hello to Martha and to renew their memberships. The Friday night AMSAT dinner at the Amber Rose Restaurant was attended by over 75 people. As usual, the staff of the Amber Rose did a superlative job of attending to our gathering, providing a fine meal at a very reasonable price, and ensuring an enjoyable evening. For the second year, we also had an after dinner speaker, with this year's speaker being Bob Bruninga, WB4APR who discussed APRS and amateur satellites.

Saturday morning was hectic from the moment the Hamvention opened at 0800 until closing at 1700 hrs. The AMSAT Forum started promptly at 0815 with Robin Haighton, VE3FRH serving as moderator. The first speaker was Rick Hambly, W2GPS who discussed AMSAT OSCAR-Echo in detail and provided an update of Project Eagle. Ed Krome, K9EK then gave an in-depth overview of equipment options for working AO-40's S-band downlink and L-band uplink in a talk entitled "Practical AO-40 Ground Stations."

The last half of the 90-minute forum highlighted "Amateur Radio on the International Space Station" and was led by Frank Bauer, KA3HDO. Frank is AMSAT's VP-Human Spaceflight. Included in the presentation was a look back at the Shuttle Amateur Radio Experiment (SAREX) and the key roles that Dr. Owen Garriott, W5LFL and Dr. Tony England, W0ORE played in getting Amateur Radio aboard the space shuttle. Both astronauts were at the AMSAT Forum and provided a number of personal insights into their participation in SAREX. Along with answering a series of questions from Frank, they also responded to questions from the audience as well. Following the forum, Owen and Tony spent some time at the AMSAT booth and were available for further questions. Both individuals were subsequently honored at the Hamvention Banquet on Saturday evening as they received the Hamvention Special Recognition Award for 2002 for their pioneering Amateur Radio operations in space.

The Forum was very well attended, with several hundred persons attending in Meeting Room 1. By itself, the Forum was impressive, but an additional opportunity to highlight satellite activities occurred immediately after the scheduled forum with a demonstration of AO-40. Utilizing a portable AO-40 ground station provided by Howard Long, G6LVB, over 70 people were able to hear the satellite using Howard's equipment that was set up in the Hara Arena Parking Lot outside the Ballerina Entrance. Take a look at the photo of Howard's impressive system on page 18 and in the May/June 2002 issue of *The AMSAT Journal* (p. 30). Meanwhile, Mike Seguin, N1JEZ provided an opportunity to hear the K-Band (24 GHz) downlink of AO-40 with his portable receiving station. For almost everyone present, this was the first time that they had heard a 24 GHz beacon. This was a technical achievement, because Mike did not have an accurate means of measuring the antenna azimuth, so he spent a considerable amount of time looking for a weak signal with a dish having a one-degree beam width. His persistence paid off, however, in hearing the beacon just prior to the Mode-K transmitter being turned off.

As the AO-40 demos were wrapping up, Steve Diggs, W4EPI worked UO-14 with an Arrow Antenna and Yaesu FT-51R HT to a crowd of about 30 onlookers. This demonstration provided an excellent opportunity for newcomers to witness the fun and excitement of making a satellite contact with a handi-talkie.

On Sunday, the Hamvention was open from 0800-1300. As in previous years, AMSAT held a new and renewing Membership Incentive raffle at 1200. To be eligible for the raffle, an individual had to either renew a current membership or join AMSAT at Hamvention itself. This year AMSAT was blessed with offering two prizes for the first time. Thanks to the generosity of Spectrum International, a Uni-Trac 2000 was first raffled. This is a device that will automatically tune a receiver/transmitter to compensate for Doppler shift and steer antennas. This prize was won by John Desmond, K0TG of Vadnais Heights, MN.

The 'Grand Prize' was a combination of Kenwood TH-D7A(G) and Arrow Antenna. This combination provides both a portable FM-Satellite capability plus digital satellite functionality, particularly for APRS. John Simpson, N3EQP of Pittsburgh, PA, won this outstanding prize. Congratulations to both individuals and many thanks to the many members who updated their membership at Hamvention.

After the Hamvention closed at 1300 hrs, attendees proceeded to Hara Arena to see if they won any prizes and our volunteers went to work on takedown. In less than two hours the entire booth was dismantled, boxes were delivered to the Mailboxes, etc. booth for UPS shipment back to the AMSAT office at Silver Spring, MD, and the van was loaded with items to be stored in our locker for next year. The same team that loaded the van on Thursday now proceeded back to the storage locker to unload the materials. The van was returned to Budget on Monday and another Hamvention was history.

As always, Dayton Hamvention continues to be an exciting place for our hobby. Despite the rain on Friday and very cool temperatures throughout the weekend, Hamvention continues to be the premier Amateur Radio show in North America. While not as many new products were announced at Dayton as in past years, there were plenty of interesting items to see and Forums to attend. SSB, DownEast Microwave, and others were selling their wares and good deals could be found on transceivers, such as the ICOM 910H. The fleamarket had folks such as K5GNA selling surplus downconverers and BBQ dishes suitable for AO-40. Certainly the social aspects of meeting fellow AMSAT members at the booth and at the AMSAT dinner are always a highlight for attendees. For some, being able to have AMSAT software demonstrated at the booth is before deciding to obtain the software is always a plus. Thanks to Keith Pugh, W5IU and the other volunteers who demonstrated software and answered attendees questions.

AMSAT certainly enhances the overall scope of Hamvention with our typically outstanding booth display, a very effective and exciting Forum, and wonderful opportunity to socialize and exchange ideas. Out success is due primarily to our dedicated volunteers who handled setup and takedown, manned the booth during Hamvention, gave presentations at the AMSAT Forum, and represented AMSAT so well during Hamvention. Special recognition is given to Martha Saragovitz, AMSAT's Office Manager who does much of the preparation work prior to Hamvention to ensure everything is on track and coordinates the myriad of details associated with this event. Ed Collins, N8NUY played a key role in the logistics at Dayton and worked to secure a new hotel for us. As I've indicated before, Dayton is both physically demanding and fun filled weekend coupled with a great sense of teamwork and cooperation that resulted in another success for AMSAT. Thanks!

Efforts are already underway for AMSAT's participation in the 2003 Hamvention. Start making your plans ***now*** to attend. If you're interested in volunteering for booth duty or if you specific ideas on how AMSAT can have a better presence at Dayton that you'd like to help implement, please take the time to contact Martha or me.

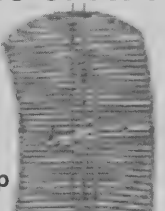
de WD4ASW

AMSAT thanks the following individuals for volunteering to serve at the Dayton Hamvention. These volunteers participated in AMSAT's Dayton operations in a variety of ways, such as booth setup/take down, serving as presenters at the AMSAT Forum, working the AMSAT booth, and giving satellite demonstrations. Clearly, the success of Hamvention for AMSAT is dependent upon having a cadre of volunteers to handle the myriad of details of such an undertaking.

- Barry Baines, WD4ASW
- Frank Bauer, KA3HDO
- Dave Bern, W2LNX
- Bob Bruninga, WB4APR
- Bob Carpenter, W3OTC
- Ken Chaffee, WA1QXR
- Ed Cole, AL7EB
- Ed Collins, N8NUY
- Steve Diggs, W4EPI
- Wayne Estes, W9AE
- Ronnie Fitch, N6SHI
- Steve Gocala, KB8VAO
- Robin Haighton, VE3FRH
- Bob Halley, K8YMI
- Rick Hambly, W2GPS
- Phil Karn, KA9Q
- Jim Keeth, AF9A
- Ed Krome, K9EK
- Nick Lauerman, KB9WWS
- Howard Long, G6LVB
- Roger Ley, WA9PZL
- Nancy Makley, KC8GYW
- Jerry Malin, N2HV
- Mike Miller, KA5SMA
- Dave Misek, N8NPX
- Mal Preston, NP2L
- Keith Pugh, W5IU
- Martha Saragovitz, AMSAT Office Manager
- Dieter Schliemann, KX4Y
- Jerry Schmitt, KK5YY
- Mike Seguin, N1JEZ
- Eduardo Valdez, DU1EV

Don't forget the Area Coordinators' Breakfast at the Fort Worth AMSAT Annual Meeting and Space Symposium! Breakfast is Sunday morning, 10 November 2002.

2.4 GHz Ant. & Preamp for AO-40 or ATV



DEM 13LNAH Preamp
Ant. mounted, .6 dB NF
15 dB gain.....**$125**

Andrews 26T-2400 Dish 24 dBi....$149 del
Rugged 2 x 3.4 foot cast magnesium/aluminum dish. 50 Ohm feed with N plug. Clamps up to 2" dia. masts. Price is delivered UPS surface in contiguous USA.
HAMS: Ask for our free 10 page ATV Catalog!
We have it all, downconverters, transmitters, antennas, all mode linear amps, etc. for the 70cm thru 3cm ATV bands. Check out our web site: http://www.hamtv.com

VISA **P. C. Electronics** MasterCard
2522 PAXSON Ln. ARCADIA, CA 91007
CALL **(626) 447-4565** or FAX 626-447-0489
WEB: **WWW.HAMTV.COM** - Email: **TOM@HAMTV.COM**

AMSAT-NA President's Letter

(August 2002) Well, I hope all of our Northern Hemisphere members have had a great summer with safe vacations. Last Month I had the pleasure of representing AMSAT-NA at the AMSAT-UK Colloquium held at the University of Surrey, Guilford just outside of London, U.K. Of the Papers which were presented, there were three from AMSAT North America, namely one by Tom Clark, W3IWI about OSCAR-Echo, one by Bdale Garbee, KB0G on RUDAK and one by Jerry Brown, K5OE on Dual Dish Feeds for 23/13 cm. All three papers were very well received and will be updated and presented again at our own Fort Worth Space Symposium and Annual Meeting, in November.

While July 2002 was the wettest July in the UK for ten years, the Colloquium was held in temperatures around 86 degrees F and beautiful sunny days. My congratulations go to the AMSAT-UK committee who organized the event, a very successful effort. As well as my being there to represent AMSAT-NA there were the presidents (or equivalent chairmen) of the AMSATs of UK, France, Germany, Denmark, Israel, and South Africa, this provided an excellent opportunity to exchange views with our overseas colleagues.

At the special request of the team working on the AO-40 RUDAK, I have authorized the spending of a modest sum for building some test equipment. This equipment will enable the amount of time that RUDAK is tested on AO-40 to be reduced, permitting other operations to take place. It is hoped that RUDAK will be available to "Joe Ham" in the next few months, and Bdale Garbee will be giving us more information on RUDAK and its operation in November - so be sure to come to Fort Worth for this valuable information.

Also to be discussed by Bdale is "Why we cannot use the Transponders and RUDAK both at the same time".

On another topic, I would like to bring to your notice the recent work of three of our members who have given a great deal of their time in preparing AMSAT position papers for the FCC. In a previous letter I have already mentioned that our Amateur Satellite Service frequencies in the 2.4GHz band are under attack from those wishing to use the frequencies commercially, and are also unlicensed. Additionally I have also mentioned the FCC Notice of Prepared Rule Making (NPR) on Orbital Debris. Well, these three members have written, discussed, modified, edited, re-written, etc. the AMSAT-NA responses to the FCC on these very important topics.

I must publicly thank Bill Tynan, W3XO Chairman of the Board, Perry Klein, W3PK VP Government Affairs, and Ray Soifer, W2RS VP International Affairs for their very hard work and for the many hours that they spent on our behalf. If you would like to see the results of their efforts please look at our filings web page. (*http://www.amsat.org/amsat/amsat-na/filings/*).

These topics will continue to be debated for some time to come, and Bill, Perry and Ray will, I am sure, continue to work these issues on our behalf. Thank you all three! Plus the several others who have supported you, by offering their thoughts and comments on the drafts.

Finally, to all the membership and those who would like to become an AMSAT member, don't forget to make your reservations for our Fort Worth symposium. This is another opportunity to meet with the Board of Directors, to look for answers and to provide your input to your organization. I look forward to seeing you there!

73,

Robin Haighton, VE3FRH
President, AMSAT-NA

Upcoming ARISS Contact Schedule

The ARISS (a joint effort of AMSAT, the ARRL, NASA, the ARISS international partners including Canada, Russia, the European Partners, and Japan) operations team wishes to announce the following very tentative schedule for ARISS school contacts. This schedule is very fluid and may change at the last minute. Remember that amateur radio use on the ISS is considered secondary. Please check the various AMSAT and ARISS webpages for the latest announcements. Changes from the last announcement are noted in italics. Also, please check MSNBC.com for possible live retransmissions (*http://www.msnbc.com/m/lv/default.asp*). Listen for the ISS on the downlink of 145.80 MHz.

For information about educational materials available from ISS partner space agencies, please refer to links on the ARISS Frequently Asked Questions page.

If you are interested in supporting an ARISS contact, then you must fill in an application. The ARISS operations mentor team will not accept a direct request to support an ARISS contact. You should also note that many schools think that they can request a specific date and time. It does not work that way. Once an application has been accepted, the ARISS mentors will work with the school to determine a mutually agreeable date.

Websites that may be of interest include:

http://www.arrl.org/sarex

http://www.arrl.org/ariss

http://www.amsat.org

http://ariss.gsfc.nasa.gov

http://spacelink.nasa.gov/index.html

http://ehb2.gsfc.nasa.gov/edcats/educator_guide/

Your completely filled out application should be returned to the nearest coordinating ARISS region if your specific region is not listed. E-mail is the preferred method of submitting an application.

Here are the email addresses:

ARISS-Canada **ve2ka@rac.ca**
Daniel Lamoureux, VE2KA
ARISS-Europe **jh.hahn@gmx.net**
J. Hahn, DL3LUM / PA1MUC
ARISS-Japan **iaru-r3@jarl.or.jp**
Keigo Komuro, JA1KAB
ARISS-Russia **n2ww@attbi.com**
Valerie Agabekov, N2WW/UA6HZ
ARISS-USA **ARISS@arrl.org**
The American Radio Relay League
ARISS-Australia **ve2ka@rac.ca**
Daniel Lamoureux, VE2KA
ARISS-New Zealand **ve2ka@rac.ca**
Daniel Lamoureux, VE2KA

ISS Expedition 5 Crew:
Peggy Whitson KC5ZTD
Sergei Treschev RZ3FU
Valeri Korzun RZ3FK

Note ARISS contacts are off limits the day before, the day of, and the day after EVAs.

Jamboree Station, The Netherlands, PI4RIS
1st choice 2002-08-24 11:55 UTC
2nd choice 2002-08-25 12:35 UTC

3rd choice 2002-08-25 10:59 UTC

Kursk's High School No. 55, Russia, 2001 direct via RK3WXZ
1st choice 2002-08-30 07:57 UTC
2nd choice 2002-08-29 08:53 UTC
3rd choice 2002-08-28 08:14 UTC

Mikve Israel School/ Givatayim Space Observatory, Israel direct via 4Z4SAT
1st choice 2002-09-04 09:44 UTC
2nd choice 2002-09-02 10:01 UTC

Whitson Crew Pick, Stanley Clark School, South Bend, IN direct via W9AB
1st choice 2002-09-05 16:23 UTC
2nd choice 2002-09-06 15:26 UTC

Whitson Crew Pick, Martensdale - St. Mary's School, Martensdale, IA
Week of 2002-09-09 TBD

Whitson Crew Pick, Silver Hills Middle School, Fairplay, CO
Week of 2002-09-16 TBD

Whitson Crew Pick, St. Mark's Lutheran School, Hacienda Heights, CA
Week of 2002-09-16 TBD

Joamie Ilniarvik, Iqualuit, Nunavut, Canada
Week of 2002-09-23 TBD

Whitson Crew Pick, Spruce Hill Christian School (K-8), Philadelphia, PA
Week 2002-09-30 TBD

Glen Waverley Secondary College, Melbourne Australia, VK3BPU
TBD

Travis Elementary, Greenville, Texas
TBD

Frank De Winne Crew Pick, Euro Space Center, Transinne, Belgium, direct via ON4ESC or Telebridge
TBD

Frank De Winne Crew Pick, Royal Technical School Belgian Air Force, Sint Truiden, Belgium, Direct via ON4BAF
TBD

Adler Planetarium & Astronomy Museum, Chicago, Illinois direct via AJ9N
TBD (Look for possible live streaming video, the website is *http://www.adlerplanetarium.org*

Center for Educational Technologies, Wheeling Jesuit University, Wheeling, WV Telebridge TBD

The latest ARISS announcement and successful school list in now available on the ARISS web site. Several ways to get there. *http://ariss.gsfc.nasa.gov*, click on English (sorry I don't know French). You are now at *http://www.rac.ca/ariss.htm*; click on News.

Currently the ARISS operations team has a list of over 40 schools that we hope will be able to have a contact during 2002. As the schedule becomes more solidified, we will be letting everyone know. Current plans call for an average of one scheduled school contact per week.

73, Charlie Sufana, AJ9N

European Space Campers Chat with US Astronaut Aboard ISS

US Astronaut Peggy Whitson, KC5ZTD was the guest of honor via ham radio on 07 August 2002 with more than 100 youngsters attending space camp in Belgium. The direct contact between NA1SS aboard the International Space Station and ON4ESC at the Euro Space Center, which is hosting the camp, was arranged and coordinated via the Amateur Radio on the International Space Station (ARISS) program.

ARISS Vice Chairman Gaston Bertels, ON4WF, said that because the youngsters spoke either Dutch or French, a computer program was used by those translating the astronaut's English, which displayed the translations on a screen. Campers ranged in age from 8 to 15 years in age.

Among other things, Whitson talked about what got her interested in becoming an astronaut. "When I was nine, I watched Neil Armstrong and Buzz Aldrin walk on the moon," she told the youngsters, "and I thought that it would be a very special job to be able to be an astronaut."

The ARISS contact got widespread media coverage in Belgium.

The space camp contact marked Whitson's third such QSO for ARISS. On 02 August, Whitson answered questions from 15 students via 8N3ISS at the Kansai Ham Festival 2002 in Hirakata, Japan. On 03 July, Whitson had a successful direct contact with DN1SZA at the Progymnasium Rosenfeld in Germany.

In other ARISS news, NASA has announced that it will deploy the last two ISS Amateur Radio antennas during the second of two space walks set for August 2002. The two VHF-UHF flexible tape antennas will be installed along the perimeter of the aft end of the Zvezda Service Module — the crew's living quarters.

Expedition 5 Crew Commander Valery Korzun, RZ3FK, and cosmonaut Sergei Treschev, RZ3FU, will carry out the space walk. Installation of the new antenna on the Zvezda Service Module will make possible two separate ham stations aboard the ISS — one on 2 meters and the other on 70 cm. Plans call for installing HF gear at NA1SS, as well as higher power VHF and UHF equipment.

ARISS is an international project sponsored jointly by ARRL, NASA and AMSAT. More information is available on the ARISS web site *http://ariss.gsfc.nasa.gov*. Information for this report was provided by Gaston Bertels, ON4WF, and by NASA.

TV via the Moon

Dr. Anthony Mann of the Physics Department at the Western Australian University has created a receiving system which allows him to tune in television signals from the US. Tony has been a DX TV enthusiast for decades, using his scientific credentials to stretch the laws of physical limits in order to "See farther and farther, unaided by satellites or wire". His latest accomplishment, apparently a first, is to work out the parameters for using the Moon as a satellite reflector for bouncing TV signals from the USA into Australia.

As regards Tony's gear, he uses an Icom R7000 receiver, a Jaycar 91-element UHF antenna fitted with GaAs-FET 20dB masthead amplifier.

So far there's nothing very special about that except that the antenna is mounted on a tripod 1.5 meters above ground with the ability to adjust both azimuth and elevation to track the Moon in his sky.

Fortunately a Moon setting in Oklahoma is well above the horizon in Perth, Western Australia.

The signal Tony receives is tiny, very tiny, and not enough to produce a picture he can watch or even sound he can listen to. At this stage, it's not about watching Bugs Bunny cartoons, it's all a bit more scientific than that.

Knowing the transmitters frequency to within a few Hertz, yes that's right Hertz, is essential as what Tony is searching for is a "beat note" indication that a carrier signal is present on the Icom receiver.

By using Web amateur "moon bounce" web sites he was able to calculate the Doppler

Members of the AMSAT-UK Executive Committee.

shift for a group of likely TV stations, and then got hold of a precise TV station's transmitting frequency down to the last two Hertz; i.e., 501.248XXX, the X's being the Doppler shift migrated.

Results this year have included signals originating in Oklahoma and Indiana.

You can read more about Dr. Tony Mann's television reception experiments at *http://www.physics.uwa.edu.au/~agm/tvdx.html* and *http://www.physics.uwa.edu.au/~agm/eme1.JPG* (this is case sensitive)

AMSAT-UK Satellite Colloquium Report

The AMSAT-UK Colloquium was held 26 to 28 July 2002. Over 90 delegates attended from 16 countries and four continents; numbers have increased again.

The beginners' sessions were also well-attended; it looked like we had a few more than last year - about 25 in each session; J. Heath, G7HIA, Ray Soifer, W2RS; and Tom Clark, W3IWI all had audiences. And the beginners' live demonstrations on UO-14 proved to be popular again; thanks to W2RS and G7HIA for doing them - contacts across the Atlantic were made with the hand-held equipment. QSL via G7HIA.

We have competitions at the Colloquium; this year we had the usual quiz plus the *Smallest AO-40 Station* and *Best Speakers* awards.

The quiz was won by Pieter De Boer, PA3FWM with 29 correct answers out of a possible 40. Paul, VP9MU, will be putting this year's questions onto amsat-bb soon.

There were two categories for the AO-40 award: one for the best station demonstrated *live* and one for other submissions. The winner in the *non-attending* class was PE1RAH; take a look at his (and other) submissions at: *http://www.uk.amsat.org/small_AO-40.htm*

The Best Speaker prize was awarded to Craig Underwood, G1WTW; The Best New Speakers award went to Mike Tyrrell, G6GAK, and Phil Masding for their presentation about space photography; fascinating images backed up by many neat software accessories.

This year the G3AAJ Trophy was awarded to Fred and Jenny Southwell, G6ZRU and G1LIT, in recognition of the hard work they put in to AMSAT-UK for many years. AMSAT-UK would not have survived without their labors; we wish them a well-earned rest.

Measurements were, this year, limited to antenna gain and matching on 1269 MHz and 2400 MHz. Antenna gain measurements were made with reference to a Polarad CA-L standard gain horn antenna, supplied courtesy of the Martlesham Radio Society (G4MRS). In all, over 30 measurements were made on the University of Surrey sports field where the antenna test range was set up. The vast majority of measurements were made on 2.4GHz antennas including dishes with helix and patch feeds. The other common antenna type was the multiturn helix. On 1.2 GHz just four antennas were measured.

Command station and UoS clean-room visits were, as usual well supported. The barbecue took place in balmy weather out on the grass beside the lake. We were joined

Participants of the AMSAT-UK Colloquium assembled in a tightly confined space!

here by a swan with babies; they enjoyed the UoS bread as much as we did. Another activity which is becoming a "regular" is live firing demonstrations of UoS propulsion systems. We weren't disappointed this year; very noisy.

Other items discussed at the Colloquim include:

• Bdale Garbee, KB0G, made the following points in his talk about RUDAK on AO-40: There are no plans to use RUDAK as an FM repeater (as happened on AO-21). The 9k6 hardware system is about 10 dB less sensitive than expected. If the current DSP tests are successful, there could be a return of the ZRO tests (weak signal reception) on AO-40

• AO-40 goes far enough out in space to pass through the earth's magnetic bow-shock sometimes (CEDEX talk by G1WTW).

• Work has resumed, with some success, on the Israeli GO-32 spacecraft with a view to putting it into amateur BBS service. The Technion Institute decided to hire a radio ham to help them promote the Techsat's BBS issue, and fulfill their promises to the amateur radio community ASAP.

The (unconfirmed) date of next year's event is 25-27 July 2003; put it on your calendar.

The proceedings document will be made available within a week or two both in electronic and paper formats. We will make an announcement on amsat-bb when it becomes available.

Pop Star Lance Bass Passes Technician Test as Part of his Quest for Space

(30AUG02) Lance Bass of the pop singing group 'N Sync is still hoping to travel to the International Space Station in late October through Russia's "space tourist" program. Bass passed his Technician license examination August 30 at an ARRL-VEC test session, and, if all arrangements can be worked out, ham radio could be a part of his space visit. He has not yet been issued a call sign.

In the US this week for training with NASA, Bass worked with the Amateur Radio on the International Space Station (ARISS) volunteer team, which included Nick Lance, KC5KBO, ARISS Chairman Frank Bauer, KA3HDO, and Carolynn Conley, KD5JSO—the Amateur Radio integration manager at the Johnson Space Center (JSC) in Houston.

"I will be staying in contact the whole time I'm up there," Bass said during a NASA-hosted Web chat with students across the US August 29. **[continued on page 30]** I'm

Participants of the AMSAT-UK Colloquium test their skills on UO-14 from the grounds of the Surrey campus.

NEWS
Federal Communications Commission
1919 M Street, NW.
Washington, D.C. 20554
Public Notice

For recorded listing of releases and texts call 632-0002

For general information call 632-7260

20909

Report No. 907 SAFETY AND SPECIAL ACTION April 19, 1974 - S

RADIO AMATEUR SATELLITE CORPORATION REQUEST FOR WAIVER OF AMATEUR-SATELLITE SERVICE FREQUENCY ALLOCATIONS GRANTED BY COMMISSION. In response to a request by Radio Amateur Satellite Corporation for authority to operate space station W3OHI in the Amateur-satellite Service using the frequencies 432.125-432.175 MHz and 2304.1 MHz, the Commission has waived the provisions of Section 2.106 of the rules regarding frequency allocations to the Amateur-satellite Service to the extent that the station may use 432.125-432.175 MHz as uplink frequencies. The waiver was granted on the condition that the earth telecommand stations used in the OSCAR 7 project have the absolute capability to disable the space station from receiving 432.125-432.175 MHz uplink frequencies should disablement be necessary for any reason. The Commission, noting that frequencies used in an amateur space station uplink would have to be in the Amateur-satellite Service, said that since neither the requested 2304.1 MHz down-link or the 432.125-432.175 MHz uplink frequencies are allocated to this service, space station W3OHI could not utilize these frequencies without a waiver of the rules. Finding that it would not be in the best interests to grant a waiver for space station W3OHI to conduct operations in the 2300-2450 MHz amateur frequency band because of international implications, the Commission said, therefore, that if the station is placed into orbit with this capability there must be adequate means to prevent it from transmitting in this frequency band. (Action by the Commission April 16, 1974, by letter. Commissioners Wiley (Chairman), Lee, Reid and Hooks.)

- FCC -

Perry Klein, W3PK, AMSAT-NA President during the launch of AO-7 in 1974, visited the AMSAT archives and found the above document issued by the FCC that actually provides a waiver for the 432 MHz uplink! As far as we know, the guidelines for the ASS were in place PRIOR to the launch of AO-7, thus the waiver was needed... CU on AO-7 "B"!!!

OSCAR 7 Lives!

Andy MacAllister, W5ACM

(*Editor's Note: The following article was reprinted from Andy MacAllister's "Hamsats" column* in 73 Amateur Radio. *Thanks to* 73 Amateur Radio *for allowing us to reprint the article.*)

It was the best AMSAT Field Day since the days of AMSAT-OSCAR-13. It was also the first Field Day for AMSAT-OSCAR-40. Numerous stations in North America were expecting great things from AO-40. They were not disappointed.

But there's more. Just before the beginning of Field Day, Pat Gowen, G3IOR sent e-mail to amsat-bb@amsat.org about slow CW, 3-digit number groups he had received on 145.974 MHz. The transmission exhibited Doppler shift during the 11 minutes that Pat could hear the signal. Was it another illegal ham-band interloper, or signals from the past? Field Day was quickly forgotten when the truth was discovered.

Ron Sparks, AG5RS makes antenna adjustments at the K5OE Field Day 2002 site.

Field Day 2002

Field Day is one of the most popular on-the-air contests/activities in amateur radio. It is held each year on the fourth weekend in June. The event is sponsored by the American Relay League (ARRL) as an emergency preparedness exercise. During the 24-hour period, U.S. and Canadian participants strive to make as many contacts as possible operating in remote locations from tents, campers, vehicles, or just a simple set up in the middle of a field.

The ARRL Field Day rules consider the amateur satellites as a separate band and provide a 100-point bonus for the first satellite contact. The Radio Amateur Satellite Corporation (AMSAT) version of the event considers each satellite as a separate band, encourages international participation and has additional rules for digital communications. Many Field Day groups have made efforts to put more emphasis on their satellite stations, both for ARRL points, and to simultaneously make contacts in the AMSAT competition.

Field Day 2002 via Satellite

Last year AMSAT-OSCAR-10 was surprisingly good. This year however, AO-10 was silent. This 19-year-old hamsat can be quite unpredictable since the onboard computer gave out over a decade ago. It is simply an uncontrolled, but functional Mode "B" (70 cm up and two meters down) transponder in space. Taking it's place this year was AO-40. Putting together a small, portable station for AO-40 is surprisingly easy. In place of the large two-meter beam required for AO-10 downlink signals, a small dish-style antenna with a 2.4 GHz to two-meter downconverter does the receiving job, while a typical 70-cm satellite Yagi takes care of the uplink. Some stations on Field Day used the L-band AO-40 uplink with appropriate dishes or Yagis.

The Fuji satellites, F-O-20 and F-O-29, were both in analog (SSB and CW) mode for Field Day. Contacts were plentiful for those that were prepared for the exceptional Doppler

shift associated with the 70-cm downlink. The signals can drift as much as 20 kHz in the course of an overhead pass. Satellite newcomers had problems keeping up.

The Russian RS-12/13 hamsat was "OK" for Field Day, but due to the activation of the 15-meter uplink (Modes T and K), it was difficult to get more than a few contacts. It's hard to tell the difference between satellite operators on the 15-meter uplink and the HF crowd that are inadvertently retransmitted. There have been no reports of any successful RS-15 contacts during Field Day 2002.

Operation via UoSAT-OSCAR-14 was once again, as expected, super crowded! This single-channel FM Mode "J" (2 meters up and 70 cm down) repeater in the sky was working well even though it sounded like hundreds of stations were trying to access the satellite simultaneously. The result was that only a few contacts are made, usually by the stations with the biggest antennas and the strongest transmitters. It was wild, but at least it was only temporary. Unfortunately there were a number of stations trying to get their 100-point ARRL Field Day bonus using HTs and small beams. Most were disappointed, but changes in the AMSAT rules made it possible for at least a few more stations to make contacts with something less than monster antenna arrays and high-power two-meter amplifiers. The modified rules specify that each station is allowed credit for only one contact per FM satellite during Field Day. Participants were encouraged to make their single contact and move on to other hamsats for the duration. Some exceptions were heard, but the really *big guns* followed the recommended procedure, made their one contact, and left.

UoSAT-OSCAR-22 was the only active 9600-baud digital satellite. For the duration of the event, stations did their best to upload a Field Day greeting message and download as many as possible. Rule changes put in place for Field Day 2000 allowed digital contacts that use the amateur-radio satellites as flying digipeaters. UO-22 supports this mode in addition to its BBS-style system. PCSat (NO-44) was also online for contacts this year.

Although contacts with the International Space Station were not counted for AMSAT Field Day operations in 2001, they were in 2002. Valery was operating Field Day from the ISS this year. Many stations simply quit making Field Day contacts long enough to get some personal QSOs with the ISS.

The Houston Connection

The Houston AMSAT Group had decided months in advance of Field Day to have a hamsat-only outing using the callsign K5OE (Jerry Brown). Three stations were commissioned to cover all of the analog and digital satellites. The primary radio for AO-40 and UoSat-OSCAR-22 was a Kenwood TS-2000 with 1.2 GHz module. A pair of Yaesu FT-847's were set up for all of the other satellites.

While the two complete arrays of KLM two-meter and 70-cm Yagis looked impressive, the five-foot dish with a dual-band (13 and 23 cm) circularly-polarized patch antenna was something to admire. The basic design was from K3TZ, but Jerry Brown, K5OE and made it a dual-band unit. A 1.2 GHz linear amplifier at the base of the dish provided plenty of power for the L-band AO-40 uplink. A 100-dB G3WDG filter in the 2.4 GHz line kept the uplink from blowing out the DB6NT preamp and Drake downconverter.

The main KLM antenna array was computer

An elegant system for L-band uplink and S-band downlink for AO-40 operation during Field Day 2002 at K5OE.

Jerry Brown, K5OE snags another one during Field Day 2002.

controlled with a UNITrack interface. Tracking software included WinOrbit and InstantTrack. The 9600-baud digital system ran on WISP while PCSat work was accomplished with Windows Hyperterminal. The Kenwood TS-2000 has a built-in 1200 and 9600-baud Terminal Node Controller (TNC).

Most of the gear worked very well with the exception of some problems with the rotators on the second KLM array, the occasional Longhorn bull, mosquitoes, the Texas heat and the occasional attack from our host's (Ron Sparks, AG5RS) killer pug dog. High points of the outing included the air-conditioned tent, a fantastic generator, great radios, excellent operators, no rain, the swimming pool and the Texas BBQ. We're doing this again next year. While sunspot cycle 23 has started its decline, the hamsats are looking and working quite better all the time.

Close-up view of the dual band (L & S) circular patch feed on the AO-40 dish.

The Surprise

AMSAT Board Member and Vice President of User Services Bruce Paige KK5DO was at our Field Day site this year, but left early due to other commitments. Just after we cleared the site to head back to town, Bruce called on the cell phone to tell us that AMSAT-OSCAR-7 was on the air. What?!? The last time anyone had heard AO-7 was in June, 1981. How could this be? I rushed home with the orbital data relayed by Bruce and made my first AO-7 contact since June 11, 1981. Unbelievable! The signals were acceptable on my home station using the Mode B 432 MHz uplink and 145 MHz downlink. Chirp was noted on CW and the SSB voice signals warbled, but it worked. Weeks later AO-7 was still working, and may be with us for a while, during it's second life.

When AO-7 (known as AMSAT-OSCAR-C prior to launch) went into space as a secondary passenger on a Delta rocket from Vandenberg Air Force Base in Lompoc, California, on November 15, 1974, there were no PCs, cell phones, and most home rigs still used tubes. AMSAT-OSCAR-6 had been launched two years earlier, but AO-7 was an advanced, multi-band hamsat with a projected lifetime of three years. When the satellite went silent (for the first time) after 6.5 years of operation, it had been running only on solar cells for a few years. One of the nickel-cadmium batteries had gone open circuit allowing the satellite to work only when illuminated by the sun. The end came when that cell shorted, or at least that's the theory.

Studies of the current CW telemetry from AO-7 show that one of the battery cells has once again opened up, thus allowing the solar panels to pass their energy on to the satellites transponders and control systems. A satellite in space goes through thermal stress as it constantly transitions from light to dark, and back again. This stress may have been the catalyst that caused the cell, or some other cell in the string to open up. ALL of the major subsystems in AO-7 are apparently working, at least when the satellite is in sunlight. It is hoped that the batteries stay the way they are for a long time to come.

Working OSCAR 7

First load up on information and be prepared for any of AO-7's modes. The best source of information is the AMSAT website (*http://www.amsat.org*). There you will find frequencies, operating tips, telemetry descrip-

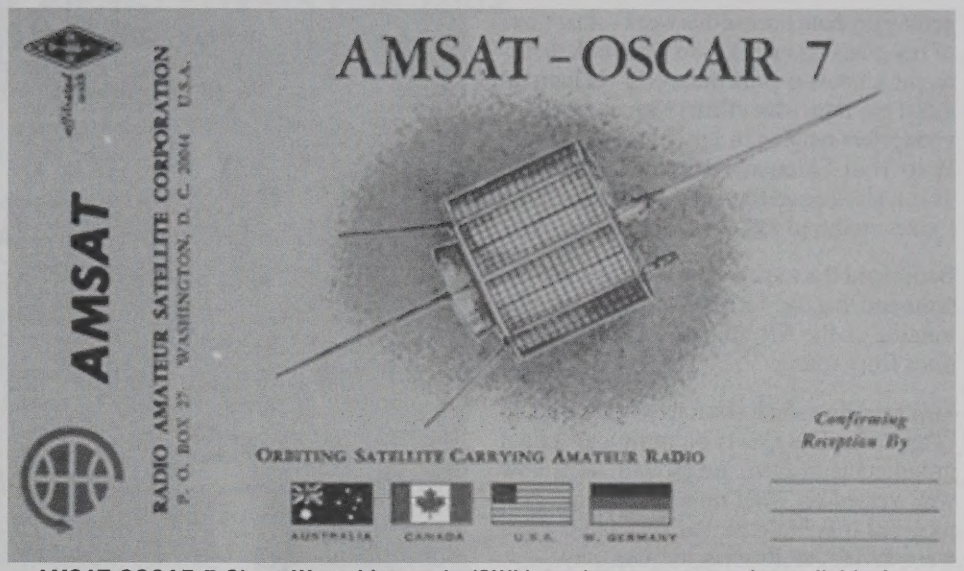
tions, the satellites specifications, old photos and a lot of history. AMSAT is even promoting a new award for seven confirmed contacts via AO-7 in the 21st century. They have also reprinted the AO-7 SWL cards that were first introduced in 1974 along with photocopies of the AMSAT Newsletter from December, 1974, complete with many facts and history about the satellite.

When AO-7 first awakens after a period of darkness, it can come up Mode "A" (two meter uplink with 10 meter downlink), Mode "B" (70-cm uplink with two-meter downlink), Mode "C" (low-power version of Mode "B"), or Mode "D" (recharge). The 435.1 MHz CW beacon may also be heard when the satellite is in Mode "A" or Mode "D." The letters assigned to the modes are from the labels of the flip-flop digital circuit outputs that turn on the specific transponders. Volunteer ground control stations began work in July to send commands to AO-7 for a less random operating pattern. A small number of the original control boxes still existed and were dug out of various garages and basements. Hams don't throw away anything.

Questions have arisen concerning the legality of the 70-cm uplink. The 432.125 to 432.175 MHz transponder input is no longer authorized for the Amateur Satellite Service, although it is still within the U.S. Amateur Radio Service. Fortunately, the FCC license for AO-7 has been maintained and is still active in the FCC system as W3OHI. For U.S. hams, operation through the 70-cm uplink, is valid per the FCC license. Other countries will have to decide whether to "grandfather" AO-7 operations. For all hams though, it is a good idea to be a good neighbor to any weak- signal 70-cm enthusiasts within range of their transmitted uplink signal.

The receivers on AO-7 are quite sensitive. Amplifiers are not necessary, but only cause "FMing" of the transponder. That's the chirp on the CW and the warbling on the SSB signals. Don't use FM or any other continuous-duty uplink signals.

Back to the future, or forward to the past? It's time to enjoy a piece of history first hand. The designers and builders of AO-7 are to be congratulated on an incredible job well done. There aren't many 27-year-old satellites still providing active service from orbit, and this one was built by hams with passion. AMSAT-OSCAR-7 - on the air again! ■



AMSAT-OSCAR-7 Short Wave Listener's (SWL) cards are once again available from AMSAT. Below is AO-7 information provided on the reverse of the card.

AMSAT-OSCAR 7

A joint project of amateur groups in Australia, Canada, Germany, and the United States, coordinated by AMSAT, the Radio Amateur Satellite Corporation.

Launched: November 15, 1974, at 17:11 GMT.

Orbit: 910 st. miles (1460 km) circular, sun-synchronous, polar orbit, 101.7 degree inclination, 114.99 minute period. Passes repeat on a two-day cycle around 8-9 AM and 8-9 PM local time.

Size: Octahedral (eight-sided) in shape, 14.17 inches (36.0 cm) high, 16.7 inches (42.4 cm) diameter. Weight: 63.7 pounds (28.9 kg).

Communications System Summary

Two-to-Ten Meter Linear Translator (Operable in Mode A)

Uplink: 145.85-145.95 MHz, circularly polarized canted turnstile (use LHCP in northern hemisphere); 80-100 watts recommended user EIRP.

Downlink: 29.40-29.50 MHz, 1-2 watts output, linearly polarized dipole antenna. A ten-meter pre-amplifier is recommended for reception. Telemetry beacon on 29.502 MHz.

Seventy-Centimeter-to-Two-Meter Linear Translator (Operable in Modes B and C)

Uplink: 432.125-432.175 MHz, circularly polarized canted turnstile (use RHCP in northern hemisphere, LHCP in southern hemisphere); 100-200 watts recommended EIRP.

Downlink: 145.975-145.925 MHz, 6-8 watts output (in Mode B) (3-4 watts in Mode), circularly polarzied canted turnstile (use RHCP in northern hemisphere, LHCP in southern hemisphere). Telemetry beacon frequency 145.972 MHz.

435.1 MHz Beacon (Operable in Modes A and D)

Output: 435.103 MHz, 300 Mw, circularly polarized canted turnstile (use LHCP in northern hemisphere, RHCP in southern hemisphere). 6-10 db of antenna gain is recommended for reception.

2304.1 MHz Beacon (Operable in Modes A, B, C, or D) Output: 2304.091 MHz, 40 Mw, circularly polarized quadrifilar antenna (use RHCP for reception in the northern hemisphere.

getting my ham license this week—that's one of my goals this week—so I can talk to different schools around the world via ham radio. That'll be a lot of fun." An audience of youngsters ranging in age from 9 to 12 from Pearl Hall Elementary School, Pasadena, Texas, also joined Bass in the Johnson Space Center studio to ask questions face-to-face.

Bauer said Bass knows the rules and regulations and that the ARISS team also supplied training on the ARISS hardware and operations from space.

"We gave him some sessions where he could listen to typical QSOs on orbit and school group contacts from the ground; he is now well versed on what to expect." Bass also received training with the ham radio hardware during his Russian training stay.

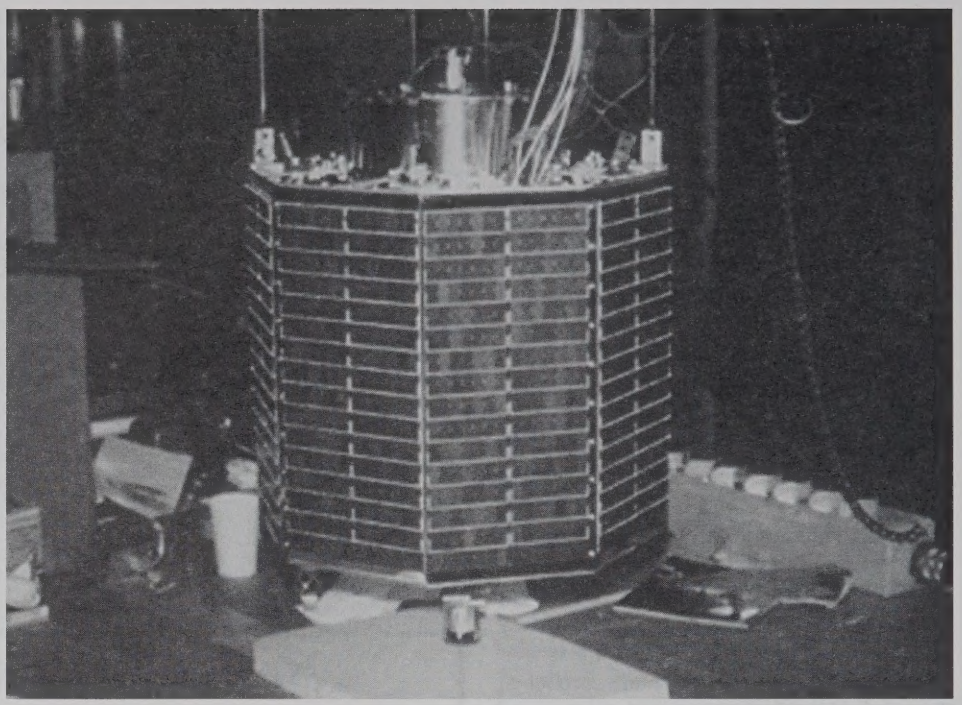
At this point, however, nothing is finalized to ensure that Bass will get on the air from the NA1SS/RS0ISS ham station on the ISS.

NASA's Carolynn Conley, KD5JSO gives ham radio instruction to *Soyuz 5*-nominated space flight participant Lance Bass as part of the crew's training and familiarization tour this week at the Johnson Space Center. [NASA Photo]

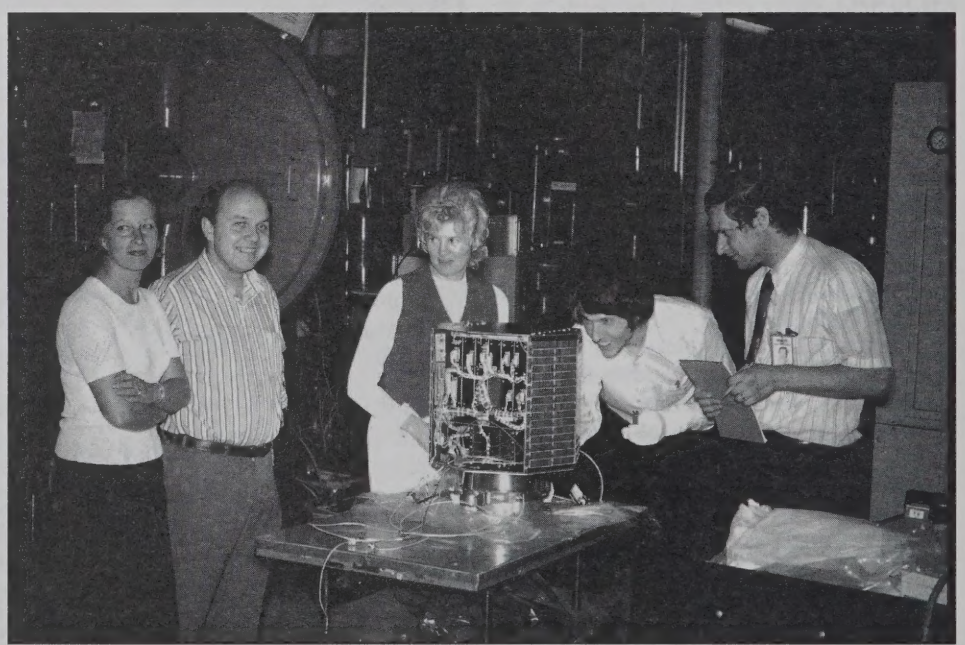
Daily discussions continue between members of the ARISS team and Celebrity Mission LLC—the group handling Bass's affairs. If all goes well, the stage may be set for Bass to communicate with the Amateur Radio community from space this fall. Bass would be part of a three-person Soyuz "taxi crew" that will blast off from Kazakhstan on October 28.

At 23, Bass would be the youngest person ever to travel into space. A remaining potential roadblock still appears to be completion of financial arrangements with Russia, which has claimed that it had not received a promised payment from Bass's organization. At one point, Russia even halted Bass's training, but he was subsequently permitted to resume. The round-trip ticket price has been generally estimated to be in the vicinity of $20 million, but all sides are keeping mum about the exact cost.

For more information about the International Space Station, the Expedition 5 crew and the taxi crew of which Bass will be a member, visit the NASA Human Spaceflight Web site *http://spaceflight.nasa.gov*.



AMSAT-OSCAR-7 on the test bench prior to launch in 1974.



AMSAT-OSCAR-7 at the thermal vacuum chamber with Karin and Karl Meinzer, Marie Marr, Jan King and Perry Klein, in 1974.

NEW AMSAT® ITEMS FOR 2002

(Suggested donations as of July 2002)

Software

		USA	Canada	Other
☐	*ARISS Resource CD-ROM*	$20	$21	$22

Contents: 400+ photos of Amateur Radio on the Space Station, Information articles, Slide Presentations, Movies of Antenna Installation EVA & School Contacts and School Contact Application

Stickers and Cloth Patch

☐	**Pressure Sensitive Sticker**	$5	$6	$7

The pressure-sensitive sticker is a 4½ by 3 inch yellow oval with the AMSAT logo in red, the words "AMSAT" and "Radio Amateur Satellite Corporation" in dark blue and sketches of AO-40 and a microsat in black and grey.

☐	**Cloth Patch**	$7	$8	$9

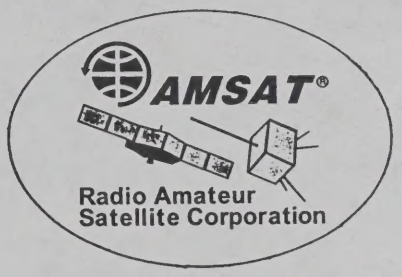
The embroidered cloth patch is a 4 by 3 inch yellow rectangle with a red boarder, the AMSAT logo in red, the words "AMSAT" and "Radio Amateur Satellite Corporation" in dark blue and sketvhed og AO-40 and a microsat in black and grey.

Frequency Chart

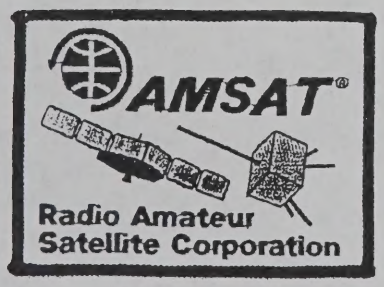
☐	**Laminated Frequency Chart**	$6	$7	$8

Compiled May 2002 this two-sided chart is printed on blue paper and laminated in thick plastic. It lists 20 current Amateur Radio Satellites plus the ISS.

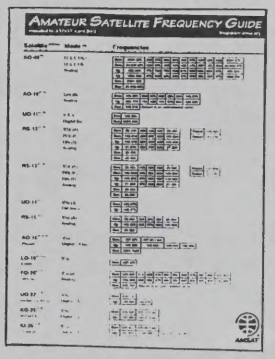
ARISS Resource CD-ROM



Pressure Sensitive Sticker



Cloth Patch



Laminated Frequency Chart

☐ Check/money order (U.S. funds only) Make checks (U.S. bank only) payable to AMSAT

☐ Charge my VISA or MasterCard Acct. #_____

Expiration Date _____ Daytime Phone #_____

Signature_____

Name_____ Call Sign_____

Address_____ AMSAT Member #_____

City_____ State_____ ZIP/Postal Code_____

Send to AMSAT, 850 Sligo Ave. #600, Silver Spring, MD 20910 or call 301-589-6062 (FAX 301-608-3410)

A new era begins.

More Power.
100W VHF/75W UHF.
Easy to Use Soft Key Menus.
Go Anywhere Size. 1.2 GHz & DSP Capable.

The IC-910H. A new era in satellite transceivers.

100W VHF/75W UHF Variable Output • Simultaneously Works Two Bands at Once • 9600 bps High Speed PACKET Port • All Mode • .11 uV Sensitivity • Main & Sub Band Functions for IF Shift, Sweep, NB, RF Attenuator • Large LCD Display • Four Versatile Scanning Functions • CTCSS Encode/Decode/Tone Scan • Built-in Keyer • PC Controllable • Memory Pad • Normal/Reverse Satellite Functions • Optional 1200 MHz Band Unit • Optional DSP

Enter a new era at your authorized ICOM dealer today.

Begin your new era here

www.icomamerica.com

ICOM®

©2001 ICOM America, Inc. 2380 116th Ave NE, Bellevue, WA 98004 • 425-454-8155. The ICOM logo is a registered trademark of ICOM, Inc. All specifications are subject to change without notice or obligation. 910HAMSAT101